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APO SAN FRANCISCO 96384

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The evaluation of fire support base defense in RVN was conducted by ACTIV during the period 1 September - 15 December 1971, to document the following: the planing factors utilized in the preparation of fire base occupancy; the fortifications, designs, and materials used in the construction of these fortifications; and the defensive tactics and techniques employed in the physical security of the bases once the construction was completed.

Fire support bases evaluated varied in size from a platoon of two light artillery tubes to two batteries of different-range artillery (light/medium/heavy weapons). The normal employment was one battery, defended by a company of infantry, with the battalion headquarters providing overall command and control of the base. Frequently an engineer element, medical personnel, and in the case of armor or cavalry units, tracked vehicles were colocated at the base. Generally, U.S., ARVN and Free World Military Assistance Forces employed light and medium weapons by sections of two guns. This type of employment allowed lighter but more complete geographical fire support coverage. Heavy artillery consisting of two tubes of 175mm and two tubes of 8-inch was employed as a composite battery.

The evaluation concluded that (1) Fire support bases were initially planned and constructed to provide artillery fire support to combat maneuver elements of the parent unit, but through the years the term "Fire Support Base" was used to refer to nearly all combat installations forward of the base camp. (2) When the tasking order was received from higher headquarters, the designated fire base commander, artillery,

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Final Report: Fire Support Base Defense

continued,

engineer, plans and intelligence officers jointly selected the site to be developed by map and visual reconnaissance, secured the terrain and began construction. (3) On terrain where the water table allowed fortifications were constructed below ground, but this was possible at only less than fifty percent of the fire support bases evaluated. (4) Construction methods used at the various bases were similiar, and in many cases, prefabricated bunkers for the tactical operations and fire direction centers, and aid stations were delivered by helicopters for installation. (5) Tactics and techniques of defense generally followed established doctrine with some modifications and variations to take advantage of terrain, weather and the enemy's capabilities.

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

FINAL REPORT

FIRE SUPPORT BASE DEFENSE

ACTIV Project No. ACG-80F

Details of illustrations in this document may be better studied on microfiche

Approved: 6 APR 1972

William K Marr

WILLIAM K. MARR
Colonel, Infantry
Commanding

3

AVHDO-DO (8 APR 1972) 1st Ind

SUBJECT: Final Report - Fire Support Base Defense (ACTIV Project No. ACG - 80F)

DA Headquarters, U.S. Army Vietnam, APO San Francisco 96375 9 APR 1972

THRU: Commander - in - Chief, U.S. Army Pacific, APO San Francisco 96558

TO: Assistant Chief of Staff for Force Development, Department of the Army, Washington, D.C. 20310

1. Subject final report is submitted for review and approval.

2. This headquarters concurs in the conclusions as written. It should be noted that this report is a technical evaluation of the physical construction and security of Fire Support Bases as utilized in RVN and does not address the philosophy or doctrine which has evolved over the years in the present Fire Support Base concept as practiced in RVN.

3. It is recommended that the philosophy and history pertaining to the evolution of the present Fire Support Base concept in RVN be the subject of a separate DA study.

4. Request one copy of all forwarding and approval indorsements be furnished this headquarters.

FOR THE COMMANDER:

PETER R. RODDA
LTC AGC
Assistant Adjutant General

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as

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DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO SAN FRANCISCO 96384

IN REPLY REFER TO:

AVIB-CO

6 April 1972

SUBJECT: Final Report - Fire Support Base Defense (ACTIV Project No. ACG - 80F

THRU: Commanding General
United States Army, Vietnam
ATTN: AVHDO-D
APO 96375

TO: Assistant Chief of Staff for Force Development
Department of the Army
Washington, D.C. 20310

1. Reference:

a. Message, ACSFOR ACTIV, DA 062345Z April 1971, subject: Army Combat Development and Materiel Evaluation (CD&ME) Program, Vietnam, for FY 71 and 72.

2. In accordance with above reference, subject final report is forwarded for review and approval.

3. Request one copy of all forwarding and approval indorsements be furnished this headquarters ATTN: AVHDO-R&D.

FOR THE COMMANDER:

EDMUND R. WILLIAMS
LTC, GS
Adjutant

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AUTHORITY

Message, ACSFOR ACTIV, Dq, ØØ23ØZ April 1971, subject: Army Combat Developments and Material Evaluation (CDME) Program, Vietnam for FY 71 and 72.

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Advanced Research Projects Agency
Second Regional Assistance Group
IV ARVN Corps
XXIV US Corp
1st Australian Task Force
1st ARVN Division
7th ARVN Division
9th ROKA Division
101st Airborne Division (ARVN)
44th Special Tactical Zone (ARVN)
3d Brigade, 1st Cavalry Division (AM)
196th Infantry Brigade
23d Artillery Group
2d Squadron, 11th Armored Cavalry Regiment

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ABSTRACT

The evaluation of fire support base defense in RVN was conducted by ACTIV during the period 1 September - 15 December 1971, to document the following: the planing factors utilized in the preparation of fire base occupancy; the fortifications, designs, and materials used in the construction of these fortifications; and the defensive tactics and techniques employed in the physical security of the bases once the construction was completed.

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The evaluation concluded that (1) Fire support bases were initially planned and constructed to provide artillery fire support to combat maneuver elements of the parent unit, but through the years the term "Fire Support Base" was used to refer to nearly all combat installations forward of the base camp. (2) When the tasking order was received from higher headquarters, the designated fire base commander, artillery, engineer, plans and intelligence officers jointly selected the site to be developed by map and visual reconnaissance, secured the terrain and began construction. (3) On terrain where the water table allowed fortifications were constructed below ground, but this was possible at only less than fifty percent of the fire support bases evaluated. (4) Construction methods used at the various bases were similiar, and in many cases, prefabricated bunkers for the tactical operations and fire direction centers, and aid stations were delivered by helicopters for installation. (5) Tactics and techniques of defense generally followed established doctrine with some modifications and variations to take advantage of terrain, weather and the enemy's capabilities.

TABLE OF CONTENTS

INDEX OF FIGURES

13

SECTION I

INTRODUCTION

1. REFERENCES

Message, ACSFOR ACTIV, DA, 062345Z April 1971, subject: Army Combat Development and Materiel Evaluation (CD&ME) Program, Vietnam, for FY 71 and 72.

2. BACKGROUND

The requirement to evaluate fire support base defense in RVN was recommended for addition to the Army Concept Team in Vietnam (ACTIV) program for FY 71-72 by Chief of Engineers, Department of the Army. The message reference in paragraph 1 approved the project as part of the Vietnam CD&ME Program for FY 72.

3. DESCRIPTION

Fire support base defense may be defined as those actions taken by an occupying force in order to protect the personnel and equipment of the base from damage and destruction by the enemy. The infantry within the fire base provides security for these personnel and equipment and may be supplemented by an additional weapons unit such as a mortar platoon. A typical base consists of a headquarters element, infantry, artillery, necessary support troops, and may contain space for additional types of artillery or supporting weapons. Physical dimensions of the area are on the order of 75 meters by 150 meters, and square, round, or triangular in shape, although this may vary to take best advantage of terrain features. Most construction is below ground, where drainage conditions allow, and fighting bunkers ring the perimeter where they provide interlocking individual and crew-served weapons fire.

4. PURPOSE

To determine and evaluate protective structures and defensive measures for fire support bases during stability operations conducted in the Republic of Vietnam.

5. SCOPE

The evaluation included interviews with commanders and their staffs of those combat units in RVN who provide artillery fire support for tactical operations of US, ARVN, and Free World Military Assistance Forces. A survey of 21 fire bases was conducted, documenting the planning sequence prior to establishment of the base, construction methods, and the tactics and techniques employed for defense of the base once established. Of these 21 bases, seven were US, ten ARVN, three Australian and one Korean. Figure I-1 shows general geographical locations of these bases within the country.

THE GEOMORPHIC PROVINCES OF
SOUTH VIETNAM

1. The Mekong Delta
2. The Mekong Terrace
3. The Southeastern Coastlands
4. The Southern Highlands
5. The Western Plateaus
6. The Northern Highlands
7. The Northeastern Coastlands

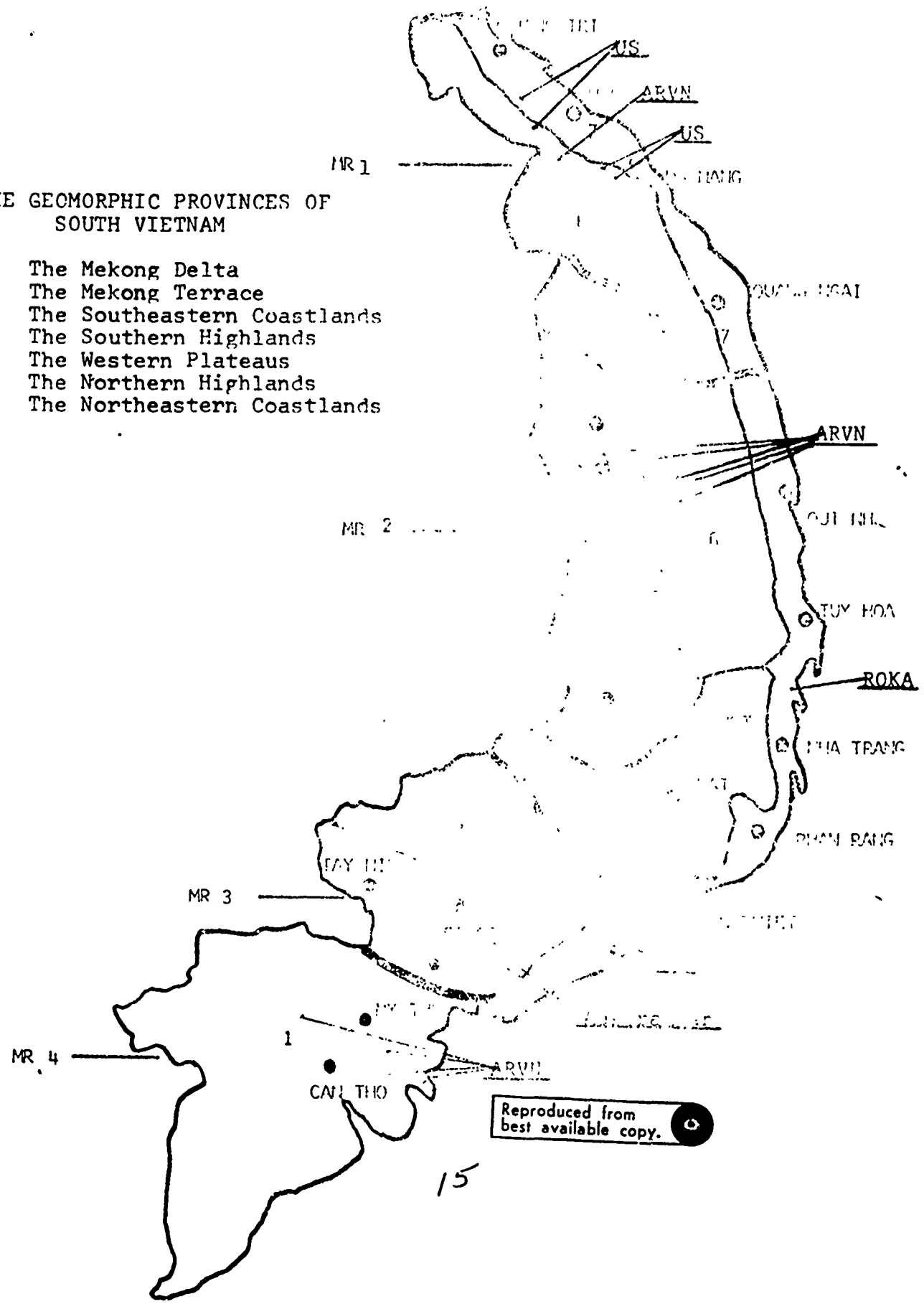


Figure I-1. General

6. OBJECTIVES

a. Objective 1 - Describe and analyze the planning factors used in the construction of fire support bases in the Republic of Vietnam.

b. Objective 2 - Describe the fortifications, designs, and materials used; evaluate the adequacy of designs against hostile weapons and tactics where possible.

c. Objective 3 - Determine the effectiveness of tactics and techniques of fire support base defense and appraise the effects that these techniques and variations have upon hostile forces.

7. METHOD OF EVALUATION

Tactical units and fire support bases were visited by the ACTIV project officer and evaluators. The primary means of documenting procedures, organizations, equipment, and facilities in use at the fire support bases was by structured interview. Additional documentation was obtained from organizational standing operating procedures (SOP's), operations plans, documented tactics and techniques, and the documenting of on-site observations. Bases were selected for evaluation in each of the seven geomorphic regions of RVN (see Annex J for geomorphic regions).

8. ENVIRONMENT

During the early part of this evaluation, until about mid-October, the southwest monsoon season prevailed, during which most of the country, except the northern highlands and the northeastern coastlands received an abundance of rainfall. Following a brief transitional period the northeast monsoon prevailed from mid-November through the end of the data collection period in December. The period of evaluation was characterized by continued US and Free World Military Force withdrawal and increased ARVN participation in the combat role. Many fire support bases which had been constructed and occupied by US forces were taken over by ARVN forces. The majority of the enemy threat against fire support bases during the data collection period was in Military Region I and the border area of Cambodia north of Tay Ninh in MR 3, where the only attack during this period on any of the evaluated fire support bases occurred. This attack was by indirect fire and did not include the use of enemy ground forces in an attacking role.

SECTION II

DISCUSSION AND FINDINGS

1. OBJECTIVE 1 - [illegible]

a. [illegible]

(1) [illegible]

(a) [illegible] depicts those units and sections found to be directly or indirectly involved in planning, coordination, and organization of a fire support base. Normally, two levels of command are considered that level which is the nucleus of the planning group. The first, or highest level, is [illegible] whose responsibility it is to determine the need and to originate the tasking message requiring that a base be established. At this level [illegible] supervisory interest is maintained. The next subordinate command is responsible for implementing the tasking message, to the extent of directing it to the next subordinate commander under whose area of operations the base will fall. The brigade provides a supervisory control while being directly responsible for obtaining complete and up-to-date information on all planning and organization from the battalion or squadron, the level of command directly responsible for actual coordination and construction of the fire support base.

(b) The battalion squadron planning group consists of the CO; an S-2 responsible for providing accurate and up-to-date intelligence of enemy activity; an S-3 responsible for conduct of movement to and establishment of the base; an S-4 responsible for all material needs, to include maintenance assistance, supply of munitions, communications equipment, generators, and construction materials; an engineer unit which is either an attached platoon at battalion level or a direct support company at brigade level; and an [illegible] responsible for integrating artillery requirements within the overall [illegible] to provide both direct support and defensive targets for the fire support base.

(c) The [illegible] battalion or squadron has the overall responsibility for fire support base planning, including the selection of the specific site, but normally delegates his authority to the S-3.

(2) Consideration of Enemy Threat and Tactical Mission Requirements

(a) The [illegible] purpose for the establishment of fire support bases as it evolved in the late 1960's was to provide a small, temporary,

----------Indirect Involvement and Coordination

———————— Direct Planning and Organization

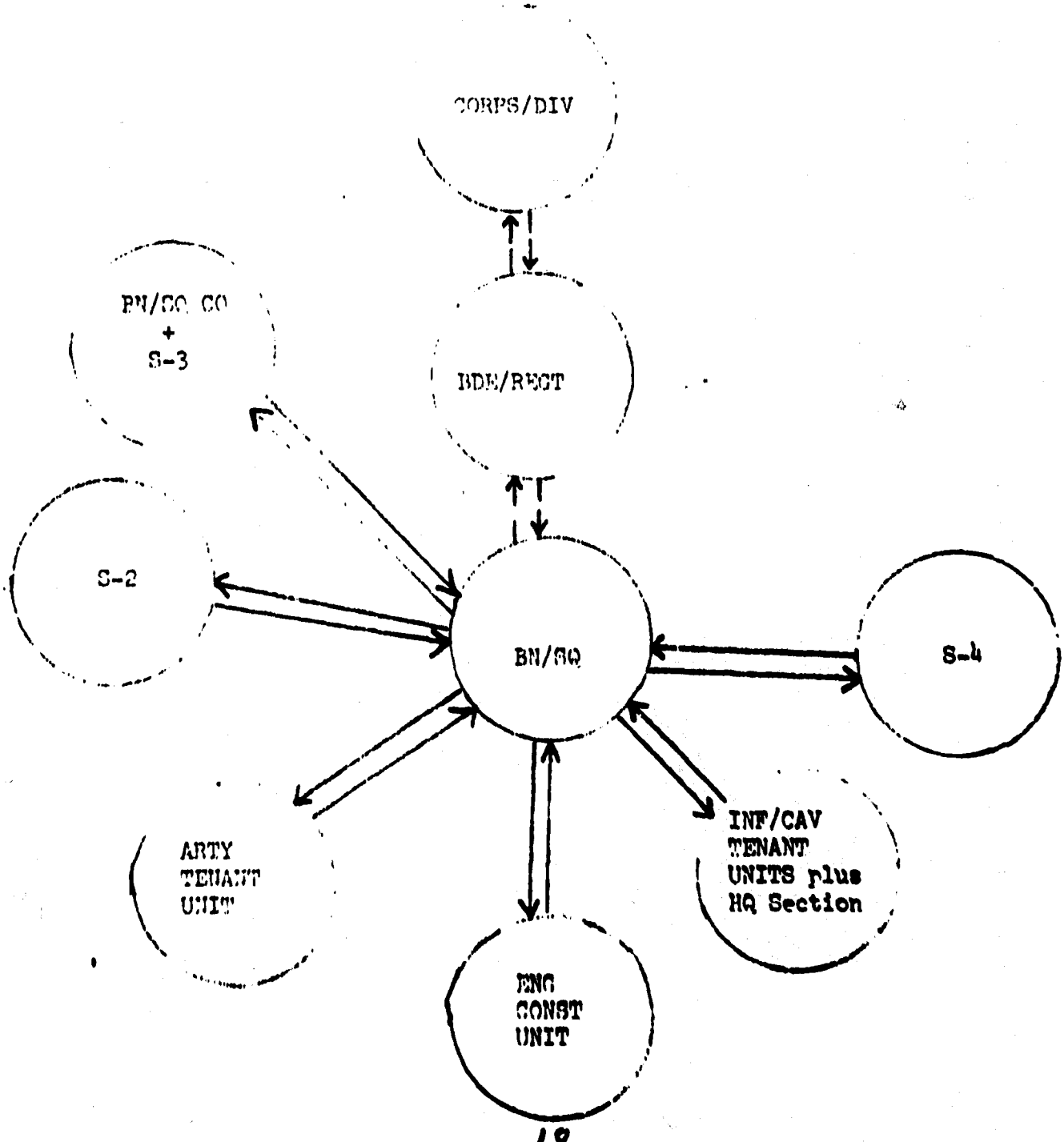


FIGURE II-1. U.S. Agencies Involved in FSB Planning.

forward base for artillery fire supporting units conducting offensive operations. Artillery was moved into the area of combat operations to support a particular action when the range from the base camp was too great to employ it from that location. This was similar to an artillery raid, although usually lasting for a longer period of time. The First Cavalry Division used this method extensively during the Pleiku Campaign of 1965. Because their area of operations extended some hundred kilometers from the base camp at An Khe, it was necessary to redeploy the artillery westward to support the [illegible] contact. This was normally accomplished by lifting the [illegible] two) by helicopter to a prominent position [illegible] fantry for security.

(b) The [illegible] of these first support artillery (usually 105mm howitzer) [illegible] resulted from Viet Cong (VC) and North Vietnamese Army (NVA) [illegible] of that period. The activities were characterized by local [illegible] against both civil and military personnel and equipment [illegible] scale seasonal offensives aimed at obtaining significant [illegible] military victories. The concept of the fire support base evolved [illegible] these insurgent activities. It became necessary to place an artillery unit forward of the base camp to support infantry units in locating the enemy from its encampment and staging areas. Through the late 1960's these bases provided the necessary offensive punch in assisting group operations.

(c) During the period of this evaluation the mission of the fire support base was found to be different in many cases from the original mission described above. The missions of 50 percent of the bases visited were specifically limited to protecting routes of supply or communication and monitoring infiltration routes. Small operations within the local area were conducted to note any enemy activity. The remaining bases, located in more remote areas, did conduct offensive operations, but not large-scale search and destroy missions. This change in the role of the fire support base resulted primarily from two factors - the drastic reduction of the enemy's offensive operations throughout RVN and the extensive reduction of US forces and [illegible] As RVNAF responsibilities increased, the protection of hamlets and interdiction of infiltration routes became more crucial.

(d) The existence of fire support bases led to an attempt by the enemy to counter the effectiveness of the bases. Attacks on fire support bases have been well documented, and review of after-action reports and ORLL's revealed that attacks varied little over the years and were classic in their preparation and execution. The sapper unit devoted as much as 5 hours between dusk and the time of attack to cover the final hundred meters from the underbrush to the perimeter wire. Once in the wire, a standard pattern of mortar and preparatory fire was begun, during which the final protective wire was breached. When the mortar fire ceased, the invaders, using RPG and B-41 rocket-propelled grenade (RPG) launchers,

continued firing close-in, the RPG explosions giving the false impression of continued mortar fire. During this confusing period of time, the sappers went about their business of depositing explosive satchel charges in the bunkers and major items of equipment, and, utilizing the cover of darkness and gunfire, exited the wire rapidly. During the withdrawal explosive charges were generally thrown into all bunkers not previously destroyed by RPG fire. An attack of this type rarely lasted over 8-15 minutes.

(e) All of the tactical unit commanders interviewed felt that the enemy threat which determines the tactical mission requirements of the occupying force was the most important factor in determining the need for and general location of a fire support base.

(3) Site Selection

(a) After the tasking message was received by the battalion or regimental command to implement a new base, an extensive map and visual reconnaissance was made of the general area in which the base was to be located. About one-half day was required to complete this reconnaissance. At all bases visited, the overall commander in charge of implementing establishment of the base was at the battalion or brigade level. The commander organized his staff to assist him in the task of site selection; this staff was made up of his subordinate commanding officers, S-2, S-3, and the engineer unit commander.

(b) In selecting a possible site, the most important factors were ability of artillery to support operations throughout the area of operations, the water table and drainage conditions of the chosen site, consideration for high ground, and accessibility of the base by air and/or road. Of primary consideration was the need to exploit the range of artillery to be located at the site, in order to provide the maximum support for offensive infantry operations. Although the majority of U.S. units deployed their artillery in battery-size or larger units, notable exceptions did exist within Military Region (MR) 3. Because of the large area of operations (AO) controlled by the 3d Brigade, 1st Cavalry Division, for example, light artillery batteries were occasionally divided - at the discretion of the supported infantry battalion commander - in order to provide extended range coverage. Two howitzers were moved by helicopter to a light, temporary, fire support base and remained at this location from three days to two weeks. By so dividing the artillery, a larger geographic area of coverage was provided, although the volume of fire to any one point might have been substantially reduced. The 23d Artillery Group, although located at semipermanent fire support bases, had also split one medium artillery battery in this AO to provide reinforcing fires to the First Cavalry. The overall effect, however, was to double the planning required,

since two bases were to be established, even though temporarily, during a planned offensive operation.

(c) In evaluating possible sites, several locations were considered. After deliberation with his staff - and based primarily on his artillery and engineer staff officers' advice - the commander chose a specific site.

(4) Construction Requirements and Priorities

(a) All units evaluated had some type of SOP for both establishment of and withdrawal from fire support bases, although they varied from brief and general to very elaborate and detailed. One unit had prepared a plan furnishing a standard layout of the base, all building materials required for its construction, a day-by-day building schedule, and the number of helicopter sorties required to fly in all personnel, equipment, and materials; it even included the cargo helicopter loading plans.

(b) Of major importance in the planning phase was the determination of construction materials required and troop and engineer support to be available. The amount of construction materials required depended upon the size of the base to be constructed. Six of the seven US bases evaluated were battalion-sized divisional bases and one was a nondivisional artillery battery base. Based upon coordination among the S-3 and the S-4, the engineer officer, the artillery officer, and other key individuals, the total requirements of troops, equipment, materials, and supplies was established. Excavation and construction priorities were determined after coordination among the infantry, artillery, aviation, and engineer representatives. Most SOP's reviewed indicated the following construction priorities:

1. Logistics helipad
2. Howitzer parapets
3. Artillery Fire Direction Center
4. Tactical Operations Center
5. Mortar Fire Direction Center
6. Medical Aid Station
7. Perimeter Berm
8. Helicopter Pad

9. Ammunition Supply Point

10. Garbage Dump.

Not included in this list is the clearing of fields of fire, construction of perimeter bunkers and fighting positions, clearing of barriers to the helipads, construction of sleeping bunkers with overhead cover, and emplacement of perimeter wire. Work in these areas was continuous and concurrent with other activities.

(c) The makeup of engineer support available varied greatly. Six of the seven bases visited had one engineer platoon attached to each battalion-size base. The platoons received all necessary construction equipment from their parent engineer companies which were under operational control of each maneuver brigade. Equipment included backhoe, D-7 and/or D-9 bulldozer, and road graders. All necessary building materials were channeled either from S-4 to engineer unit, as generally was the case, or from engineer stocks directly. This included all construction materials. Engineering equipment was available to construct roads, clear sites, dig underground facilities, and to push up berms. This equipment greatly enhanced the defensive facilities that could be fabricated and, in addition, reduced the critical time period of initial construction, when the probability of attack was most likely.

(d) Base size, configuration, and type of facilities to be constructed were determined after consideration of the implementing unit's requirements. The bases observed did not conform to any standard configuration. All U.S. fire support base commanders were given a free hand in establishing the configuration and facilities on their respective bases. Size of each was dictated by the makeup of using forces. Type of facilities and construction depended upon commanders' desires and availability of engineer equipment and materials.

(e) The level of completion to which the construction was carried out and the nature of the facilities installed depended somewhat on the intended longevity of the base. Almost all U.S. bases were classified as being of "indefinite" nature. The term "indefinite," however, implied a range from five weeks to six years, depending on the mission of the base. Due to the present shift to a defensive posture by the US forces, base duration is being extended to maintain more of a protective rather than offensive capability. The larger, more complex bases required up to 30 days for completion, as reported by the attached engineer commander.

(5) Deployment of Troops and Artillery

(a) Before this phase could be initiated, prior planning at

battalion level had to provide a systematic and logical withdrawal plan from previous locations. Several factors, such as amount of equipment and retrievable items to be moved had to be assessed, as well as distance to the new site, weather conditions, general enemy situation, how artillery support would be effected at the old base, en route, and at the new base.

(b) Two types of movement were utilized by U.S. forces to secure the new fire support base by vehicle convoy and airmobile occupation by helicopter. The move was usually made by convoy if lines of communication to the new location were secure. Movement by helicopter was used only when there were no roads to the new site or existing roads passed through an insecure area with known enemy presence or the likelihood of hostile forces. Three of seven bases evaluated moved the occupying force to the site by helicopter because there were no roads to their mountaintop sites. The four remaining units moved by convoy, utilizing their organic vehicles. Initial occupation of the new fire support base sites was by combat assault, one by dismounted infantry, the second by armored infantry carriers. In both instances the occupying unit was a company and was accompanied by one platoon of combat engineers to sweep the area for mines and boobytraps as the infantry secured the area. Where air transportation was necessary, a plan of sortie moves was established by the S-3 to insure the maximum utilization of aircraft and the fewest number of sorties.

(c) The movement of the howitzers was considered by most commanders to be the most important phase of deployment to a new fire support base. During movement from an old fire base to a new fire base, artillery support may be required either in support of continuous infantry offensive operations or in a defensive role to both the old and new base. Artillery support during the deployment stage was provided by one or by a combination of two or more of the following three methods:

1. Half of the artillery remained at the old base until such time as the other half has been emplaced and registered at the new base;

2. Receiving artillery support from bases within range of the deploying units' route of travel;

3. Organic fire support assigned each convoy.

Establishment of fire support bases was characterized by speed. All moves were planned by the commander to encompass withdrawal from the old site, completion of the move, and establishment of artillery fires at the new location by the end of the first day. At all bases evaluated this task had been completed within that time frame.

(d) During initial deployment of the units evaluated, an average of one-third of the occupying force was designated as an advance party for security. The battalion/squadron S-3, or in one case, the company commander, was responsible for initial base security. Available assets for defense during initial occupation were restricted by mode of travel to the site. For air transportation, troops were limited to personal weapons. Where deployment was accomplished by vehicles or boats, .50-caliber machineguns and/or 90/106mm recoilless rifles were used. Four of the seven bases had been deployed by air for the entire establishment of base and for support. The advance party (approximately 70 personnel) arrived at the site as early as possible during first light. Upon arrival at the site they immediately deployed into platoon patrols and secured the local area up to 300 meters out from the intended base perimeter. These security patrols were conducted throughout the construction phase. Once the advance party was inserted, support troops were next inserted, followed by artillery and ammunition, engineer equipment, and logistical and construction equipment and materials.

(e) All units specified certain aspects of construction to be completed by nightfall of the first day's occupation. These included:

1. One row of defensive wire emplaced
2. Perimeter berm pushed up
3. Overhead cover built for all troops
4. Hasty fighting positions prepared
5. Helicopter pad completed
6. Artillery positions sited
7. Latrine ready for use
8. Command post excavated and construction under way.
9. Temporary communications established.

Artillery was emplaced on the first day to provide a greater defensive posture for the fire base and to permit rapid assumption of the fire support role. The decision of when the artillery was to arrive was formulated during the planning phase, and it depended upon the amount of development required at the new site.

b. ARVN

(1) Responsibilities

Figure II-2 depicts the units or individuals normally involved in the planning of ARVN fire support bases. In contrast to U.S. forces, ARVN does not delegate the responsibility of planning fire support bases to those levels of command actually occupying the base. Otherwise the planning at the headquarters is similar to that of the U.S. forces.

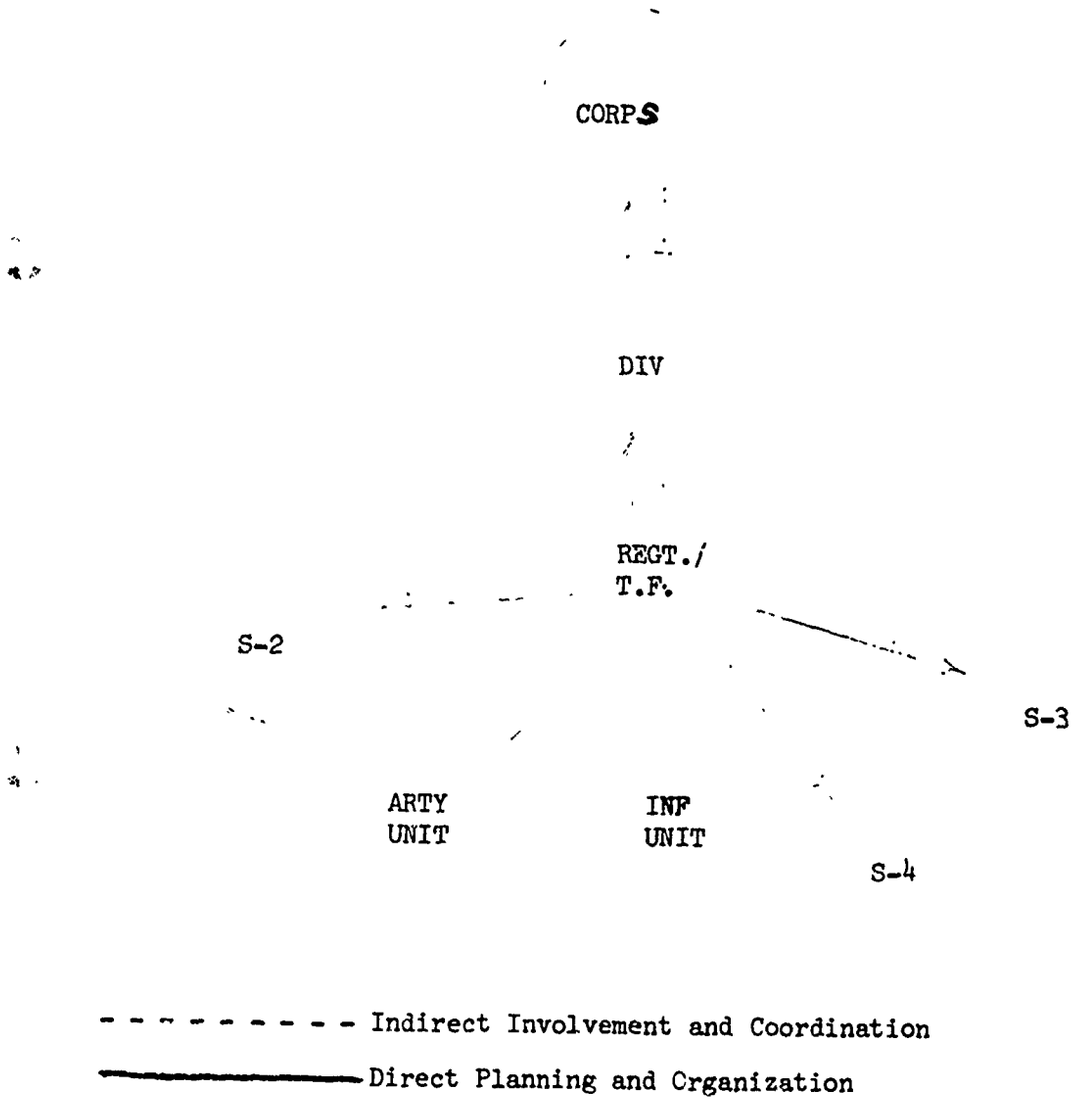


FIGURE II-2. ARVN Agencies involved in FSB Planning.

(2) Tactical Mission Requirements

(a) Of the ten ARVN fire support bases evaluated, four of the bases represented a reoccupancy or relief of U.S. units. Of the other six bases, four were Regional Force (RF) artillery units, one a special task force, and the last was a border ranger base established with the assistance of U.S. Special Forces several years ago. The RF fire support bases were located so as to provide road and hamlet security to the maximum range of their weapons; therefore, their locations were planned by corps to provide maximum coverage of the corps geographical area. One artillery unit was in direct support of the special task force and accompanied them to provide offensive waterway and hamlet security. This unit also provided road protection operations. The ranger camp was strategically located to provide continuous surveillance within the region adjacent to Cambodia and Laos and to provide early warning to the corps headquarters should the border be violated.

(b) The mission requirement was assigned by division for divisional units and by corps for all other units. In the case of RF artillery, the requirements were coordinated through the local province chief, who in most instances (when the artillery was not attached to an ARVN unit) maintained operational control of the RF troops. The same was true with Popular Force (PF) troops, who were under the operational control of the district chief but could be attached to ARVN for a specified mission or a designated period of time.

(3) Site Selection

(a) It was found that, generally, the same factors considered by U.S. forces were also used in selecting ARVN fire support bases. The selection of a specific site took place at the corps/division level, however. Authority was not given the commander of the tactical unit to occupy the base as was the case with U.S. forces. The province/district chief selected RF/PF fire support base sites, unless they are attached to ARVN, in which case the sites were selected at corps/division level.

(b) It is of interest to note that in the case of the four bases which represented reoccupancy or relief of U.S. forces, the selection of the sites had been done by the RVNAF Joint General Staff in coordination with the Commander, U.S. Military Assistance Command, Vietnam (MACV) and further coordinated through the regional corps headquarters. Where the site was an existing fire support base, only map reconnaissance was used.

(4) Construction Requirements and Priorities

(a) ARVN also used SOP's for establishment and construction of fire support bases. Troop requirements varied with the organization of the corps forces. Within IV Corp, three of four bases visited were platoon size, a platoon consisting of two 105mm howitzers and an average of 35 persons. The remaining base was a regimental headquarters, quartering 150 personnel. Of the remaining six ARVN bases in II and III Corps, five were

battalion size with from 150 to 380 personnel. The last was a platoon of 45 personnel. Half the bases observed were round and half were square in configuration. Terrain dictated base configuration in some cases, and in others this was determined by higher command. The fact that three of the four bases evaluated in IV Corp were platoon size reflects the lack of availability of artillery assets. As in the case of U.S. bases, all the ARVN bases are termed "indefinite" with regard to longevity.

(b) ARVN engineer support was not available within the chain of command below corps level and provided no assistance in fire support base construction. All facilities were constructed by initial occupying forces with materials provided by regimental S-4. Construction equipment and materials were nonexistent at eight of the bases visited. Commanders cited the lack of engineer support and materials as the prime reason for inadequate structures.

(c) Construction priorities are basically the same as for U.S. bases, although taking longer in the construction phase due to the lack of heavy engineer equipment. Basic requirements were preparation of artillery emplacements, the defensive perimeter, and overhead cover for all personnel. Heavy equipment assistance for excavation and clearing fields of fire could be requested from [illegible] and was sometimes available and provided.

(5) Deployment of Troops and Artillery

(a) ARVN forces [illegible] utilized about one-third of the occupying unit forces for [illegible] party. However, in the case of the three small platoon-sized units, averaging 35 personnel, this security force was further augmented by [illegible].

(b) Where the ARVN bases represented reoccupation of U.S. bases, the takeover and withdrawal from each base was accomplished by U.S. and ARVN to simultaneously, with artillery pieces remaining on a part of the base, thereby eliminating the possibility of any time lapse in supporting fires. Of the ten bases evaluated, troops at eight bases had been deployed by road, while at two in the Mekong Delta they had been deployed by boat. It was learned that in some situations where the base was located on a mountaintop, helicopter airlift had been requested and obtained from U.S. forces.

c. FWMAF

(1) Responsibilities

(a) Figure II-3 illustrates those units and individuals responsible for planning and coordinating fire support base construction and

occupancy for the 1st Royal Australian Task Force (RATF). Following coordination with the infantry commander as to area of operations to be supported, the task force artillery officer made the site selection after detailed map and aerial reconnaissance. Principal staff officers were notified of the impending move and the engineer unit issued a warning order for the construction required. If other combat or combat support units were to occupy the area, they too were notified at this time.

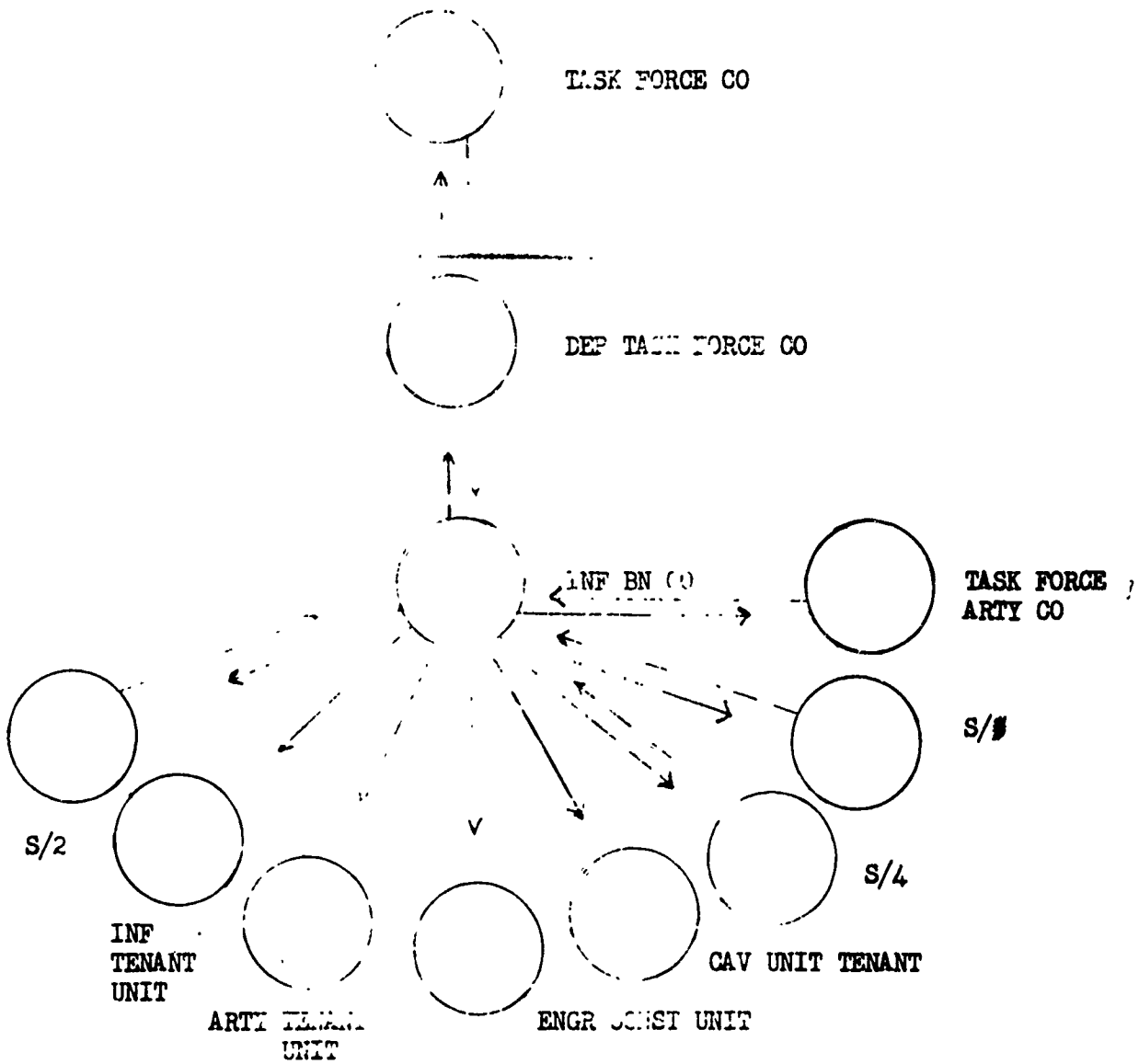


FIGURE II-3. Royal Australian Task Force Agencies Involved in FSB Planning.

(b) Figure II-4 indicates the headquarters and unit personnel responsible for the planning process of the 9th Republic of Korea Army (ROKA) Division's fire support bases. Battalion units to occupy the base were tasked through the battalion headquarters by the regimental commander. The infantry and artillery company/battery commanders were assisted in their preparation by principal members of the battalion staff. The planning process was simplified somewhat in that all Korean fire bases were of a standard design throughout the division, and deviations from that pattern developed only as a result of continuing maintenance and upgrading. Engineer support in the construction of fire support bases was generally not provided, since the majority of bases were reoccupancies of bases originally developed by U.S. forces, and construction necessitating use of heavy equipment had previously been completed.

(2) Tactical Mission Requirements

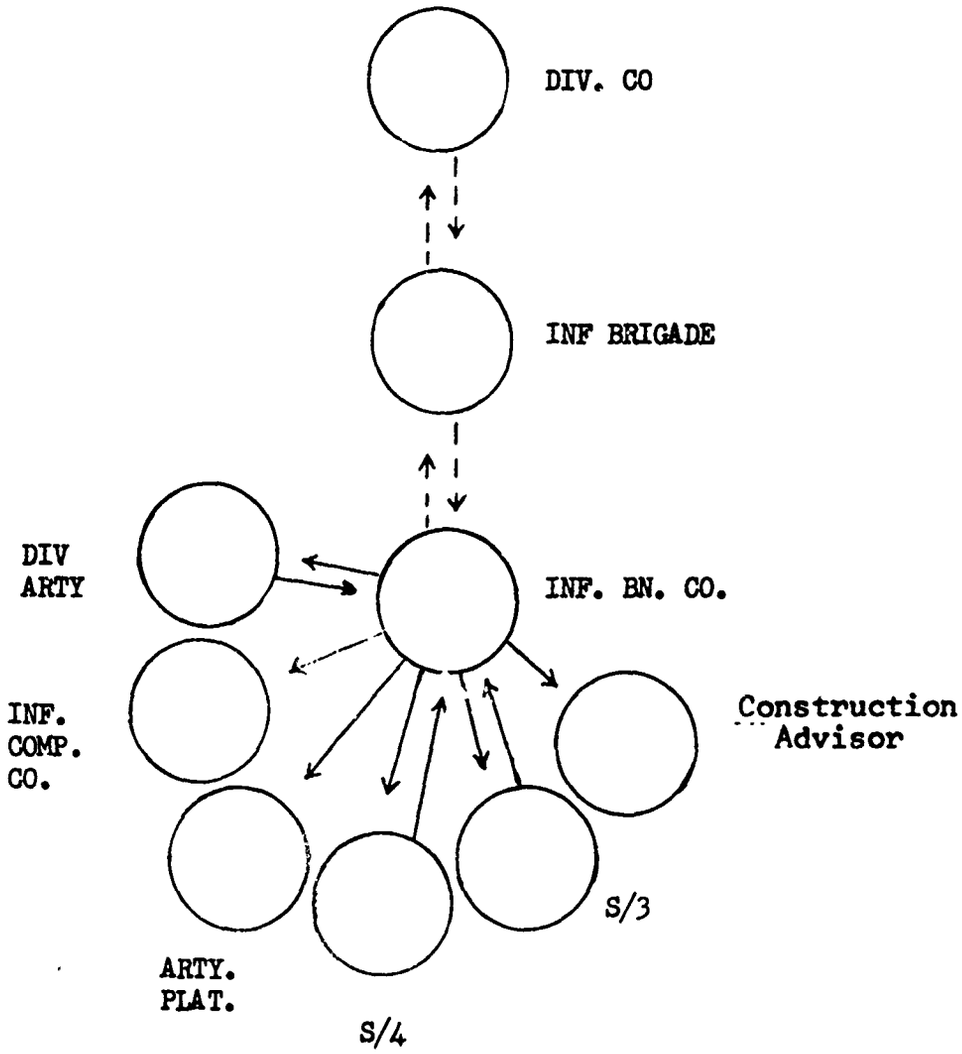
(a) The Australian mission was offensive in nature and as given to the task force was "...To search for, close with, and destroy the enemy in your area of operations...." Because of this offensive-type mission the majority of their fire support bases were temporary in nature and provided maximum coverage by being centrally located within the infantry regiment's area of operations. When necessary to extend the coverage for company operations, the firing batteries were divided into sections of three guns per fire base. Infantry security forces were provided in the former case; however, the artillery provided for their own security in the latter, unless the fire base was utilized as a night defensive position, in which case additional forces would be available.

(b) The Korean mission was to provide security for lines of communication and to prevent enemy infiltration within their AO. As such, the base evaluated was occupied by one artillery platoon and an infantry company.

(3) Site Selection

(a) Australian forces relied entirely on the artillery force commander's assessment of the best location for support, and accessibility by road and drainage actually became of secondary importance. All the base sites visited were new.

(b) The Korean forces selected sites in essentially the same manner as U.S. forces. The one fire support base visited, however, was one previously selected and occupied by U.S. troops.



- - - - - - - Indirect Involvement and Coordination

——————— Direct Planning and Organization

FIGURE II-4. ROKA Agencies Involved in FSB Planning.

(4) Construction Requirements and Priorities

Both the Australian and Korean forces had SOP's on the organization and construction of fire support bases.

(a) Under the Australian concept of troop employment and fire support base organization, each base was of section size, a section being three 105mm howitzers and consisting of 60 to 70 personnel, 40 of whom made up artillery crews, while the remainder of the force comprised the headquarters, FDC and medical aid elements. Each base was responsible to the nonresident infantry commander being provided artillery support, while all other phases of operation were under the supervision and support of the force artillery advisor. All bases observed were triangular, 50 meters on a side.

(b) The Korean concept called for company bases to be under battalion supervision and commanded by a company grade officer. Each base was characterized by the same requirements for personnel, each having three maneuver platoons, a mortar section, and an artillery platoon, headquarters, headquarters platoon, and an aid station. All Korean bases in RVN had a circular configuration.

(c) The Korean fire base which was evaluated had previously been constructed and occupied by U.S. forces. Consequently, only construction upgrading had been required of the ROKA Division. Conversely, all Australian fire support bases were new, and three days had been planned for construction of the full-size base; however, one full day was sufficient for construction of the smaller base, since engineer support was available and furnished in both cases. Daily construction requirements for the larger base were identical to the U.S. patterns; i.e., perimeter wire, gun positions, and overhead cover completed by the end of the first day of occupation.

(d) Engineer support for the Australian force was provided by a direct support engineer company responsible for the entire construction of each base. Australian engineer equipment was found comparable to that of the U.S., but due to the concept of "temporary" base construction, the only equipment required was a D-7 bulldozer to push up a berm (an elongated earthen mound surrounding the perimeter) and dig a slight indentation in the center of the base for a TOC/FDC combination. Korean engineering assistance was restricted to an engineer advisory group at brigade headquarters. The group supplied supervisors for fire support base construction. Actual construction was done by the tenant unit, using only hand equipment. Even with these equipment limitations, 80 percent of the structures were partially underground.

(c) As contrasted to U.S., ARVN, and Korean bases, which were all considered to be of "indefinite" longevity, the Australian bases were considered temporary. Because of the requirement to support the highly mobile infantry operations conducted, fire support bases were manned for only three to six weeks. Because of the simplicity of these bases, construction normally required only three days. Facilities were limited to prefabricated-type fighting and sleeping bunkers, utilizing culverts.

(5) Deployment of Troops and Artillery

The Australian and Korean forces, as with the U.S. forces and some ARVN units, utilized approximately one-third of the occupying unit's troops as an advance security party. The Australian advance party consisted of 20 men supported by a platoon of APC's, three with .50-caliber machineguns. The local area was secured up to 100 meters from the perimeter and continued throughout the 3-day construction period. Upon completion of construction APC's were withdrawn to the rear. All troops were deployed by road. The sequence of deploying remaining forces, equipment, and materiel was the same as for U.S. forces. The Korean advance party consisted of one platoon of 20 men and a platoon leader. The party was limited to personal weapons. Platoons patrolled the area out to 200 meters from the perimeter throughout the construction stage.

d. Findings

(1) Corps or division originated the directive for establishment of U.S. fire support bases [II-1a(1)(a); p. II-1].

(2) The battalion/squadron commander was responsible for planning the U.S. fire support base [II-1a(1)(c); p. II-1].

(3) U.S. fire support bases were originally planned to support offensive operations and have since become defensive type bases providing security to lines of communications and to the local populace, monitoring infiltration routes, and supporting the plan of maneuver for friendly forces [II-1a(2); p. II-1].

(4) All units evaluated had some type of SOP for establishment of and withdrawal from fire support bases [II-1a(4)(a); p. II-5].

(5) Movement of the howitzers was the most important phase of deployment to a new fire support base [II-1a(5)(c); p. II-7].

(6) ARVN did not delegate authority for fire support base planning lower than corps headquarters [II-1a(5)(c); p. II-9].

(7) ARVN engineer support was not generally available for FSB construction below corps level and provided no assistance in fire support base construction [II-1b(4)(b); p. II-11].

(8) The RATF artillery officer selected sites for Australian fire support bases [II-1c(1)(a); p. II-11].

(9) In the case of U.S., RATF, ROKA, and some ARVN units, security during the construction phase of fire support bases was provided by an advance party of one-third of the occupying unit's troops [II-1c(5); p. II-16].

2. OBJECTIVE 2 - Fortifications

a. U.S. Forces

(1) Configuration, Size and Perimeter Design

Examples of configuration are at Annex A.

(a) Six of the seven bases evaluated were battalion size, with an artillery battery attached; so each included approximately 250 personnel. Bases varied in configuration at the different locations. One of the seven U.S. bases was circular in shape; two were rectangular; one was triangular; and three, located in mountainous areas, conformed to the contours of their hilltop sites. All commanders interviewed were eager to defend their choice of configuration, and no particular configuration appeared to be more advantageous overall than the others.

(b) A typical triangular fire base measured 200 meters on each side, with strong points consisting of bunkered automatic weapons located at the vertices. The two-man bunkers were dug into the 4-foot berm on each of the three sides.

(c) The circular base configuration had been selected because of the internal fire support available and the need to defend toward all quadrants. This base, 400 meters in diameter, was located in a flat, open area with no wooded areas or jungle growth within several kilometers. A berm 7 feet high around the perimeter contained 25 defensive bunkers at 50-meter intervals. Alternated between the bunkers were M113 armored personnel carriers (APC's) mounting .50-caliber machineguns or 40mm grenade launchers. Five Sheridan weapons systems were also interspersed inside the berm to provide fire support outward. The interior provided positions for a medium field artillery battery of self-propelled 155mm howitzers and two self-propelled 175mm guns.

(d) One of the rectangular bases was situated atop a small rise in the Mekong Terrace region. Because the base dominated the surrounding terrain (all approaches to the base ascended a 20-to-60 percent slope) no perimeter berm had been constructed. There was a small berm, however, pushed up around two opposing corners of the base where mounted M-55 quad-.50-caliber flexible machinegun positions were emplaced. Each of these weapons could provide 270-degree coverage to the outside of the base, thus ensuring complete coverage of the entire area surrounding the base. Additionally, two fighting positions were located along each side of the perimeter for defense and observation.

(e) The three mountaintop fire support bases conformed to the terrain, but could generally be described as elliptical in shape. Bases of this type were located in the Northern Highlands and were from 500 to 1000 feet above the valley floor. Generally, trenches 2-5 feet deep were dug around the perimeters, connecting fighting positions, rather than using a pushed-up earthen berm. This afforded good visibility in observing the slopes, as well as providing excellent fields of small arms fire. The fighting positions utilized organic infantry weapons for defensive firepower. Two of the three fire support bases of this type had 105mm artillery batteries in position, and the third base had a 105mm battery and a half-battery of three 155mm howitzers.

(2) Facilities Design

(a) Bunker Construction

1. According to all personnel interviewed, facilities such as fighting, working, sleeping, and storage bunkers should, ideally, be placed underground. This type of construction was underground whenever possible. The most important factor which precluded underground construction were the height of the water table and the lack of availability of heavy construction equipment. Of the seven bases, three were located in the Mekong Terrace where the water table was relatively high year-round (Figure II-5). One of these bases had water above ground, because of the constant traffic of tracked vehicles within the perimeter, and underground construction was never considered. A second base was situated on elevated, but rocky, terrain. This made excavation difficult, but even so, the TOC/FDC were underground, as well as approximately 20 percent of the remaining structures. The third base emplaced their TOC below ground; however, all other structures except the perimeter berm bunkers were above ground level. Three of the four U.S. bases evaluated in the Northern Highlands were not concerned with the water table problem because of their mountaintop locations, and, consequently, approximately 60 percent of their structures were situated below ground. The high water level at the fourth base made excavation difficult.

2. The minimum overhead bunker cover observed at any of the bases was three layers of sandbags. Cover varied from this minimum to the inclusion of pierced steel planking, bridge timbers, additional layers of sandbags, and in one case in the highlands, a 4-foot-thick concrete cap on an underground bunker (see Annex D for data concerning barrier thicknesses required for protection).

3. Units of airmobile divisions often utilized bunkers prefabricated by the engineers and airlifted to the site once the excavation for the structure had been completed. In one of the methods previously mentioned a helicopter set the structure directly into the prepared position, and troop labor covered it (see Annex B for bunker construction).

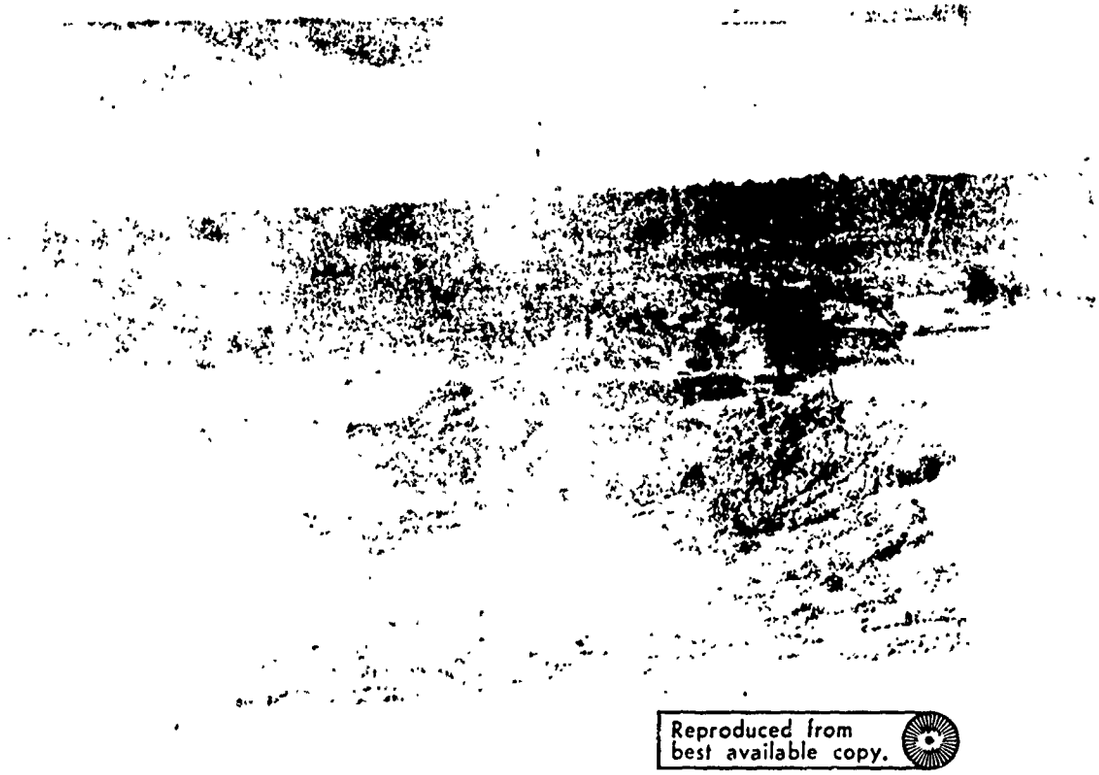


FIGURE II-5. Bunker Construction in Perimeter Berm Showing High Water Table.

4. All of the bases used some type of steel culverting for the construction of fighting positions and sleeping bunkers. All three Mekong Terrace bases evaluated utilized half sections of steel culverting varying from 48- to 72-inch diameter covered by layers of sandbags. One base used half sections of 72-inch corrugated metal pipe, 12 feet long, bolted to a 12x18-inch timber lengthwise on each side and placed atop 55-gallon drums filled with sand (Figure II-6) to form three-man sleeping quarters for the squadron staff. These were then covered and revetted with sandbags to a height of 3 feet on all sides. Another base utilized 48-inch culvert 8 feet in length set on a row of four sand-filled ammunition boxes (Figure II-7) for individual troop quarters. The hilltop base in the Mekong Terrace, because of its relatively small troop population, was able to utilize what had previously been an underground brigade command bunker for troop billets. All of the four northern bases evaluated had built 8x12-foot bunkers for their personnel, consisting of bridge timbers covered by steel planking and three layers of sandbags. Because of the rocky nature of these mountaintop bases, the bunkers extended only about 3 feet underground. Sleeping quarters alternated with fighting positions, and trenches were dug between them on the base perimeters. The commander of these four bases did not permit overhead cover for the fighting positions, indicating that they preferred not to trade the unlimited visibility for the protection that such cover might have provided the sentries from incoming fires. The circular base constructed 8x12-foot fighting bunkers in the perimeter berm, with steel planking for side retaining walls, and 2x6-inch planks over steel matting, topped by three layers of sandbags, for overhead cover (Figure II-8). These bunkers and the alternating APC's served as sleeping quarters for all troops within the confines of the perimeter.

(b) Artillery Emplacements

The placement and construction of pads upon which to place the artillery pieces was a major problem at all bases, but probably even more so in low-lying areas during periods of heavy rainfall. Extensive construction effort was used in stabilizing the gun pads for heavy artillery, due to their recoil (Figure II-9). Medium self-propelled guns firing in wet terrain often dug in extensively with their tracks and grades. Differential settling caused delays in relaying the tubes after firing (Figure II-10). Towed 105mm and 155mm howitzers did not present so extensive a problem; although, when a base was planned for long-term occupancy, some subgrade preparation was made to provide soil stabilization and drainage by filling with crushed rock and covering with packed soil,

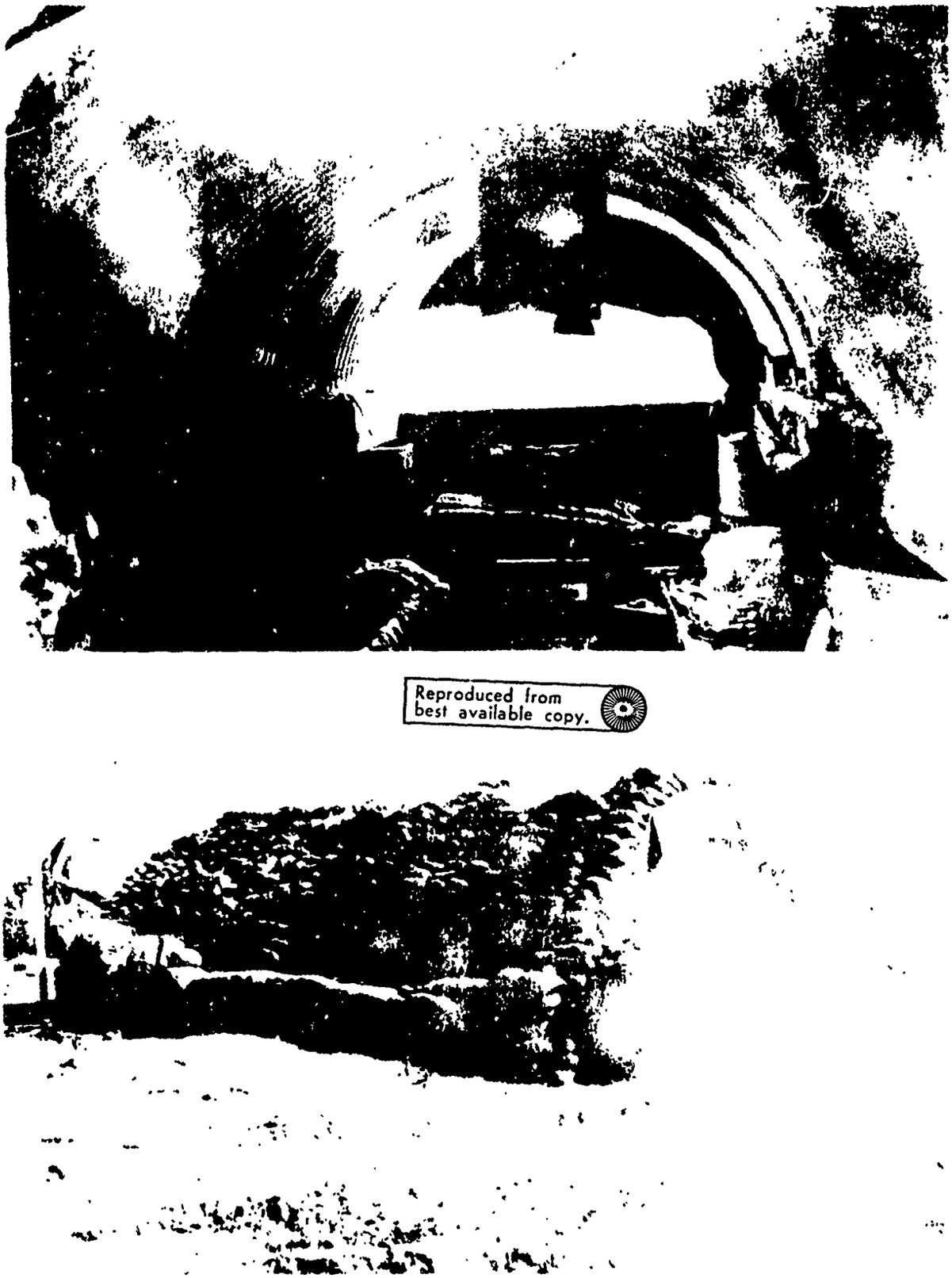


FIGURE II-6. Sleeping Quarters Prepared From 72-inch Culvert.

FIGURE II-7. Sleeping Quarters Prepared From 48-inch Culvert.

FIGURE II-8. Interior of Berm Fighting Position.

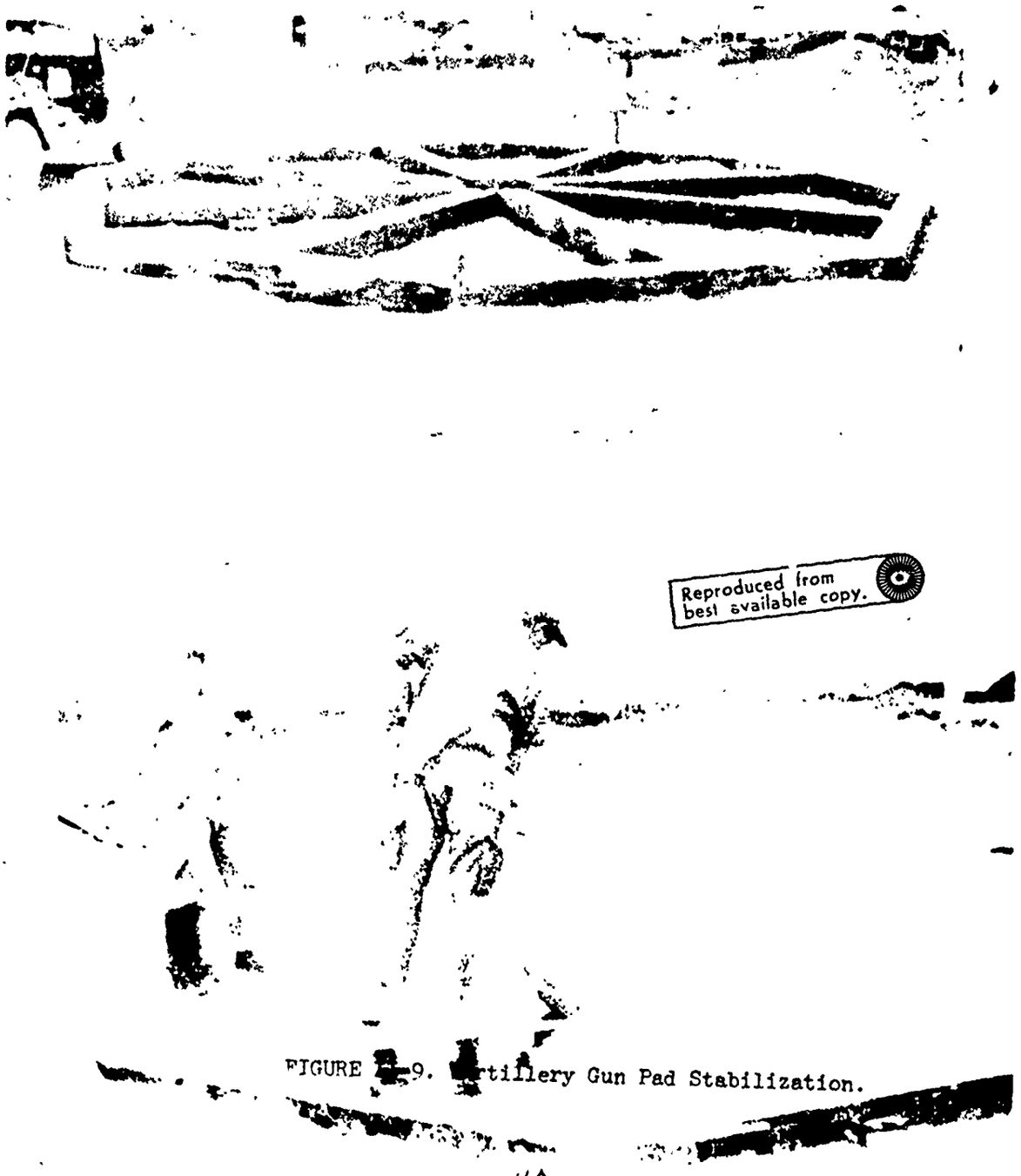
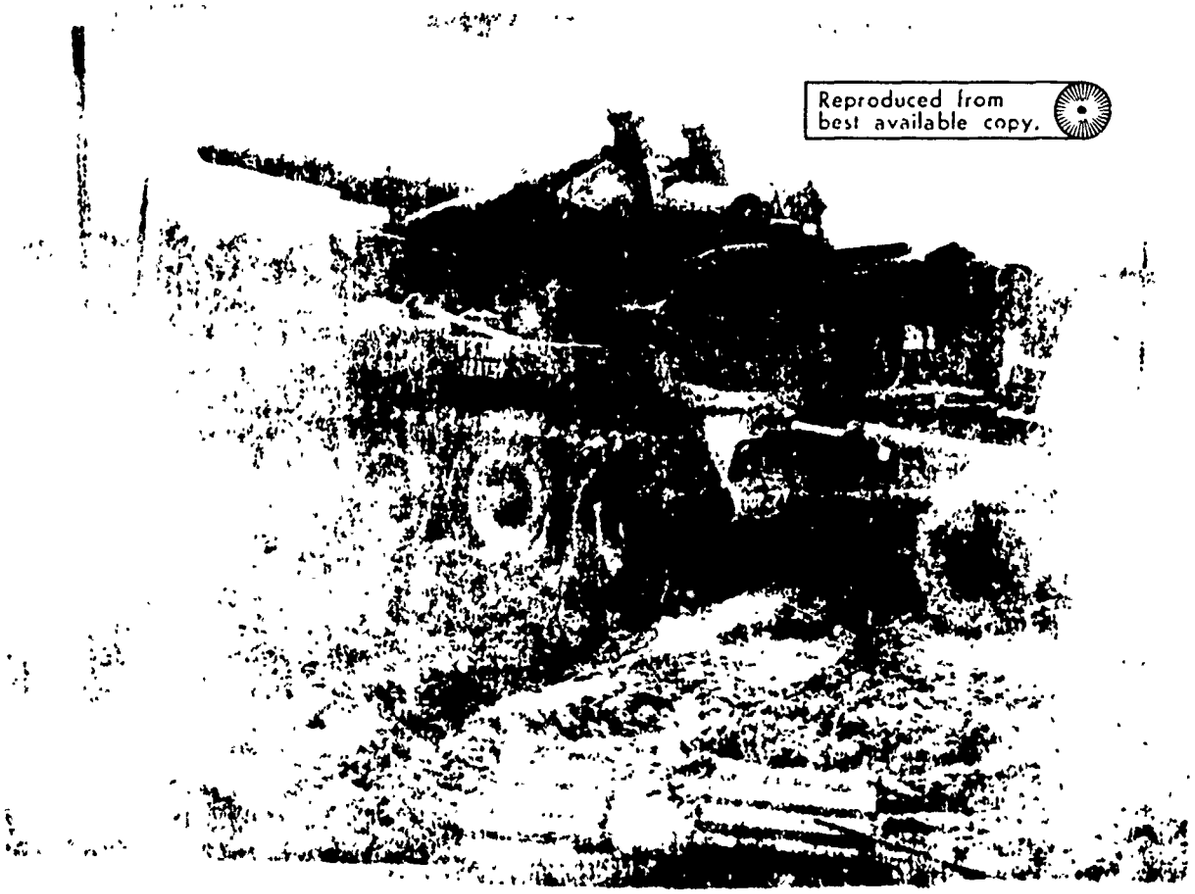


FIGURE 2-9. Artillery Gun Pad Stabilization.



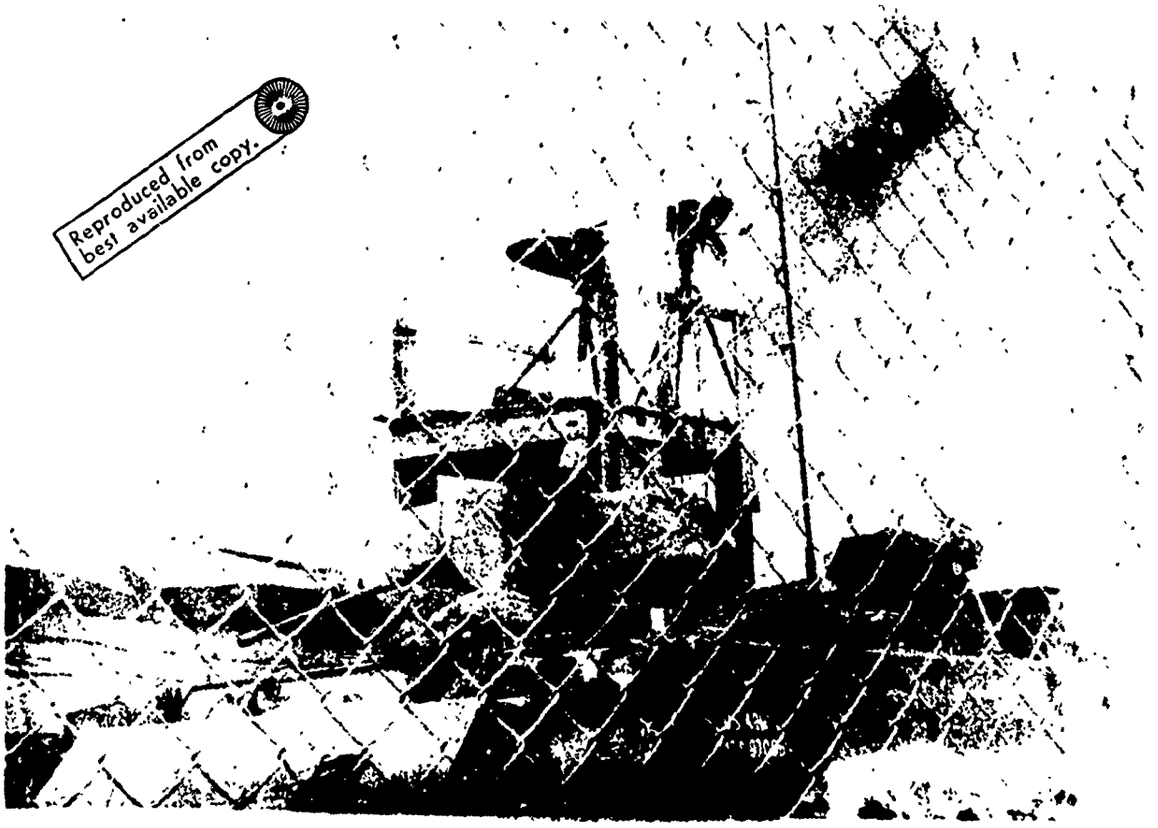
asphalt, or peneprimed soil. Parapets surrounding the artillery pieces were constructed, variously, by pushing up earthern berms, stacking sandbags, using retaining walls filled with soil, soil-filled ammunition boxes, and combinations of these. Sandbag parapets at one base were coated with an asphalt cutback sealcoat which the artillery commander claimed double sandbag life by waterproofing. Ready ammunition was stored in compartments within the parapets at all bases evaluated.

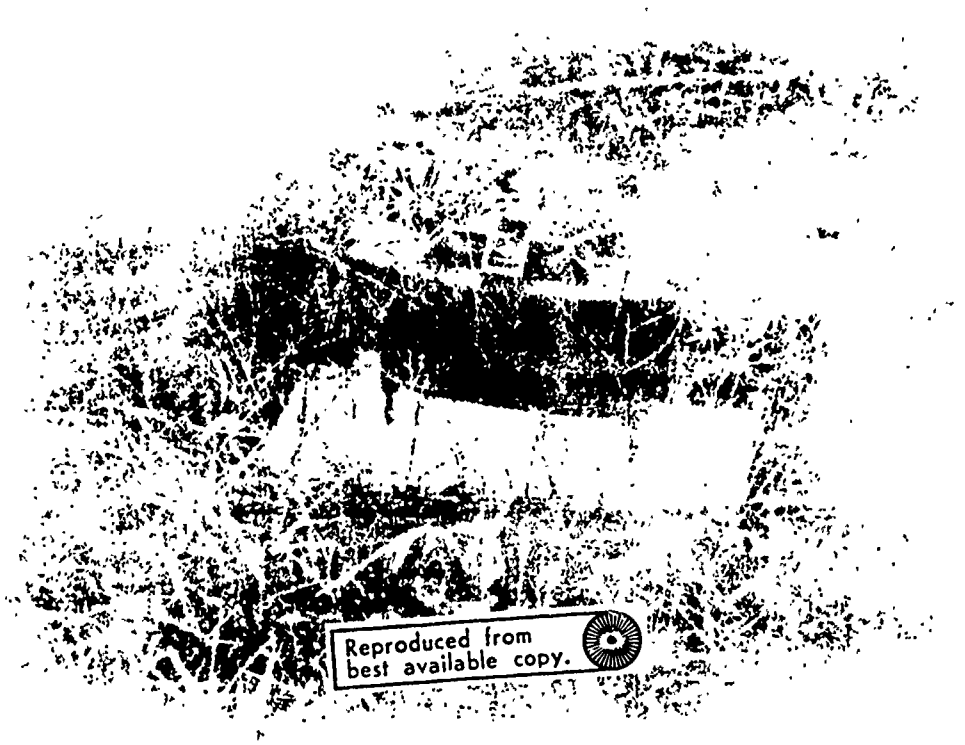
(c) Warning, Protective, and Detection Devices; Obstacles and Wire Entanglements

1. All fire support bases utilized trip flares, claymore mines, and wire entanglements in varying proportions and amounts depending upon availability and the commander's desires. Wire entanglements were emplaced in accordance with the provisions of FM 5-15, Field Fortifications. One additional type of wire was introduced to tactical elements during the combat in RVN -- chain-link fencing, sometimes known as "cyclone" fence and commonly referred to by combat troops as "RPG wire" (Figure II-11). This fencing was introduced to the theater in 1968 in an attempt to reduce or eliminate the effect of B-40 and B-41 rounds against defensive bunkers and light armor not otherwise protected. Upon striking the chain-link fence, the rounds are detonated; if the fence is located at a standoff distance or 10 feet or more from the intended target, the effect of the exploding round is minimized. Although not initially planned as protection against sapper penetration of the perimeter, the chain-link fence proved to be effective for this purpose. It was not only difficult to cut through, but, when properly emplaced, proved to be almost impossible to climb over or tunnel under without detection.

2. In regard to the use of concertina as protective wire, one commander thought wire with coils of smaller diameter would be more effective in deterring penetration by the relatively small-sized enemy soldier. Furthering this theory, another base crushed triple-concertina to a height of 6 inches above the ground and installed a second band of triple concertina on top of the first in the normal manner. Theoretically, this would reduce the enemy sapper's ability to squirm through the consertina belt without great difficulty. The installation of this fence was said to be quicker and easier than the installation of tanglefoot, which is also used as a deterrent to sapper penetration.

3. Command-detonated claymore mines were utilized at all fire bases, although their numbers varied from 60 to 200, dependent upon the commander's desires. Only two of the seven cases retrieved their claymores during daylight hours to prevent tampering. Daily recovery and redeployment of the mines was not practiced at the mountaintop bases, since the claymores were emplaced downslope from the perimeter and the daily recovery of these would have been very time consuming. One base set their claymore mines in cement to prevent tampering or reversal by the enemy (Figure II-12).

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4. One of the U.S. fire bases evaluated had a CSR-3 surveillance radar which operated during the hours of darkness and was supplanted by a 50-foot tower with two observers during daylight. All remaining bases used the PPS-4/5 surveillance radar, and one base, in addition, employed the MPQ-4 counter-mortar radar.

5. Three of the U.S. fire support bases evaluated used floodlights to illuminate the outer perimeter of their areas. All these lights were assembled through the use of field expedients by troops at the field locations. Two units had obtained housing reflectors for their individual lights, and one had improvised with #10 cans. All three bases used 150-200 watt bulbs, with the lights mounted upon poles, approximately 8 feet above the ground and 25 meters forward of the berm or inner perimeter. Only two commanders said that the lights were used continuously at night. The third who had floodlights preferred to use them only in the event of an enemy attack. Four of the seven commanders interviewed expressed a preference for perimeter lighting, when available, while the rest felt that the lights would reveal their positions and activities to the enemy and said that they would be reluctant to use them at their bases.

6. All U.S. bases evaluated used some form of electronic sensors as detection and warning devices, although two of the bases' readouts were monitored directly by their higher headquarters which, in turn, relayed warnings of activations by radio back to the TOC of the base involved. Fougasse was employed at five bases, and Husch flares, at four, along with ARA (aerial rocket artillery) flares for marking perimeter position (see glossary in Annex F for explanations and descriptions of employment). A notable field expedient at one base was the use of empty tin cans strung two feet deep and four feet wide to the inside of an internal row of concertina. This provided a most effective noise barrier and as an additional benefit furnished a simple disposal means for cans. All cans were washed thoroughly before emplacement to prevent infestation by vermin.

b. ARVN Bases

(1) Configuration, Size, and Perimeter Design

Three of the ten bases evaluated had been developed by U.S. forces previously, and their original configurations remained unchanged. One mountaintop base in the Northeastern Highlands and one hilltop base in the Western Plateaus had been constructed to conform to the terrain, utilizing all available cleared area, although the mountaintop base was a regimental command post and was roughly four times the size of the other. Of the remaining bases, one was triangular, one circular, and six were rectangular. All commanders interviewed stated that their bases, as configured, provided the best defense possible for that location. All bases

were sized to best accommodate the number of troops and artillery weapons located within their particular perimeters. Physical perimeter sizes ranged upward from a triangle-shaped, two-howitzer 105mm artillery section of 50 meters per side, to the mountaintop regimental base previously mentioned, containing a battery each of 105mm and 155mm howitzers. The latter was approximately 50 by 400 meters in size. Numbers of fighting positions and strong points located at the perimeter of those bases evaluated conformed to the standards mentioned in the discussion of U.S. bases. The one notable exception encountered was the fire support base of the border ranger unit, where family living quarters were built into the berm, and the roofs and sides were capped with one foot of concrete. This base was the second largest of those evaluated. In addition to its being the battalion command post, quartering approximately 380 rangers, it provided facilities for the families, their privately owned domestic animals, and a hospital for soldiers and dependents. The perimeter was further extended by the employment of 16 rows of defensive wire entanglements.

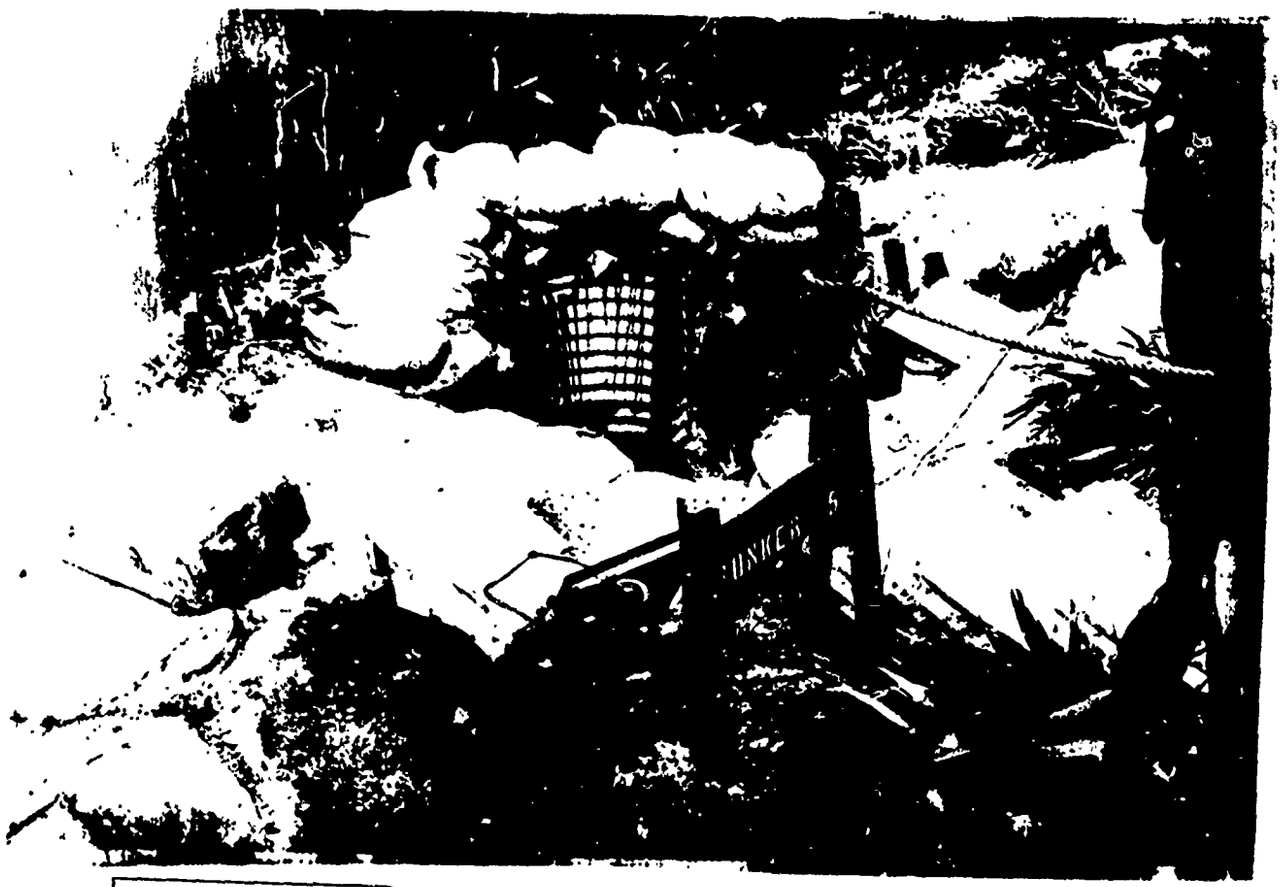
(2) Facilities Designs

(a) Bunker Construction

As mentioned above, the border ranger base utilized hardened bunkers on the inner perimeter, rather than the earthen berm found so frequently at other fire support bases. These bunkers were approximately 15 feet wide and 8 feet in height. They covered almost 80 percent of the perimeter diameter and were partitioned inside into one- or two-room quarters. An open hallway along the outer side provided small-arms firing ports at 10-meter intervals. The remainder of the bases utilized defensive bunkers built into the berm, ranging in size from 4x6 feet up to 8x12 feet. All were of wooden construction with overhead cover of three layers of sandbags. Supplementary foxhole-type fighting positions were spaced every 10 meters at 50 percent of the bases (Figure II-13). Four bases had observation towers. Use of native timber was more prevalent in the construction of bunkers and towers than at U.S. bases, where class IV supplies were readily available during construction. There was also much less underground construction than at U.S. bases, due mainly to the lack of availability of heavy construction and earth-moving equipment.

(b) Artillery Emplacements

There were no major differences noted in the construction of artillery emplacements other than the fact that ARVN frequently utilized 105mm ammunition boxes filled with dirt or sand to construct the berm around each weapon. One base had provided a means of gun-pad stabilization by driving empty 105mm shell cases into the ground upon which the weapon wheels would rest (Figure II-14).



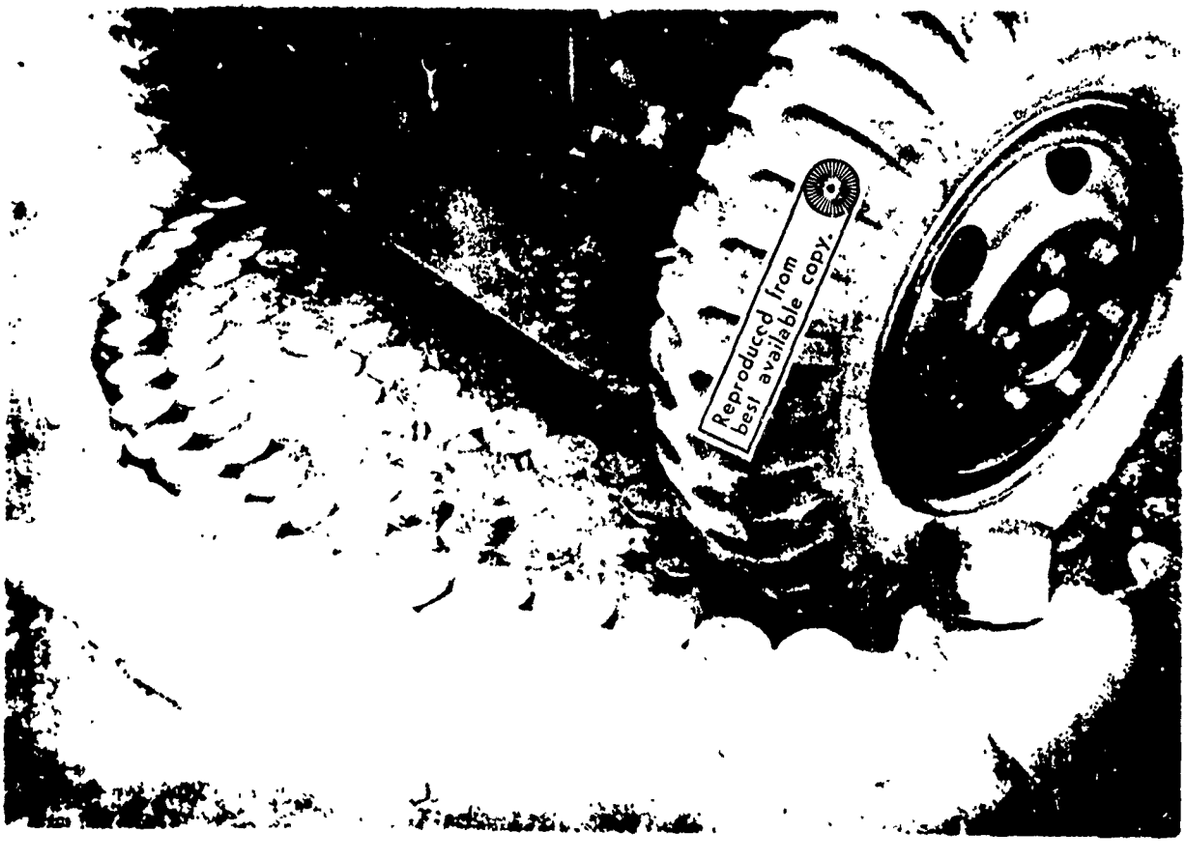


FIGURE II-14. Artillery Pad Stabilization Utilizing 105mm Shell Cases.

(c) Detection and Warning, Delay, and Protective Materials

Multiple bands of protective wire ranged from three rows of concertina upward to 16 rows in combinations of triple concertina, tanglefoot, low wire, and four-strand barbed wire fences. Four of the ten bases used chain-link fencing for RPG protection. The most extensive outer perimeter obstacles were at the border ranger fire support base. They consisted of eight rows each of concertina and low wire entanglements placed 10 meters apart. Inside the wire a moat, 10 feet wide and 15 feet deep, extended around 80 percent of the base. The commander's plans called for completion of the moat around the entire perimeter and emplacement of punji stakes between the moat and the defensive emplacements. All but two of the bases had integrated electronic sensors and trip flares into their defenses. The commanders at the other two RF artillery bases explained that neither sensors nor flares were available to them through their normal supply channels. The evaluators noted that fewer trip flares were utilized by ARVN forces than were used at U.S. bases, and this was attributed by the ARVN commanders to lack of supply availability. All fire bases, with the exception of the two RF bases noted previously, had starlight scopes available for passive night observation.

c. FWMAF Bases

(1) Configuration, Size, and Perimeter Design

Examples of configurations are at Annex A.

(a) Royal Australian Task Force (RATF) fire support bases evaluated differed considerably in mission requirements, as noted in objective 1. The RATF performed a purely offensive task of searching out and destroying enemy forces in their TAOR, consequently the three bases evaluated could be best described as utilizing "hasty" construction methods and techniques (in USA engineer terms). That is to say, the bases were constructed within three days and were rarely occupied for longer than six weeks; thus there was no need for a continual upgrading program necessitated by long-term occupancy. The bases were of triangular configuration, 75 meters per side. A 3-foot berm had been pushed up on all sides by engineer bulldozers, and fields of fire were cleared to approximately 200 meters out from the perimeter. Three two-man fighting positions were emplaced within each side of the perimeter berm, utilizing culvert sections as retaining walls.

(b) The ROKA mission was largely a defensive role to prevent infiltration and to protect major lines of communications (LOC's). The fire base evaluated was situated on a prominent hill, overlooking

the South China Sea to the east and highway QL-1 to the west. This circular base and its outside perimeter were completely cleared of vegetation for 130 meters. Fourteen 8x12-foot fighting bunkers, interconnected by a trench 4 feet deep, provided the first line of defensive firepower for the inner perimeter. The positions had no overhead cover. The base was approximately 200 meters in diameter (to the inner perimeter).

(2) Facilities Design

(a) Bunker Construction

1. Sleeping quarters for the Australian artillery crews were dug into and under the howitzer emplacement berms, providing complete underground shelter. An M113 had been driven into a depression approximately 4 feet deep, cut by engineer bulldozers during initial construction. This defilade position was centrally located and provided the section with its fire direction and communications center. Ammunition storage points had also been dug into each gun emplacement berm.

2. At the ROKA fire base, trenches interconnected the four sleeping bunkers with the fighting bunkers. This provided cover to personnel moving to occupy defensive positions in the event of a ground attack. Each of the sleeping bunkers was approximately 24 feet square, and they were underground with exits at both ends. Upright and overhead supports were formed by 14x20-inch timbers. Overhead cover included a layer of 6x12-inch timbers covered with aircraft runway matting. Above the matting were four layers of sandbags covered with asphalt cutback and topped with 2-3 feet of sod. A sandbagged fighting revetment was placed above each of these bunkers for internal security, if needed.

3. The TOC at the ROKA base was situated in the center of the base and on the high point of the hill. Extending 6 feet into the ground, it had been constructed using heavy bridge timbers for vertical and horizontal supports and 2x12-inch lumber for siding, sandbagged to a depth of 2 feet. An observation tower with 8-foot square platform was mounted above the TOC, providing visual observation of the entire base area and surrounding terrain.

(b) Artillery Emplacements

1. The Australian force used only compacted earth on which to emplace their three 105mm howitzers. During the rainy season, sand was sometimes used within the gun pit to provide a firmer footing on what otherwise would have become mud. Ready ammunition storage and crew sleeping bunkers were built into the emplacement berm as previously described.

2. The Koreans developed their parapets by stacking 155mm shell cannisters, filled with soil, into a circular revetment and then pushing an earthen berm up around the outside. Three fighting positions and a ready ammunition storage shelter were then built into the berm at ground level. Asphalt cutback was utilized for soil stabilization for both the emplacement surface and the outer berm (see Figure II-15). Three 81mm mortar emplacements were dug to a depth of 3 feet, the inside walls lined with lumber from ammunition boxes, and a berm provided all around with two layers of sandbags. Ammunition storage was built into the side of the emplacement and a drainage sump located beneath the mortar base plate (Figure II-16).

(c) Warning, Protective and Detection Devices, Obstacles, and Wire Entanglements.

1. Both Australian and Korean forces employed Phase I hand-emplaced seismic sensors around their defensive perimeters. Normal employment was six sensors randomly placed, approximately 500 meters from the base. The sensor readout was located in the base TOC/FDC. Australian fire base commanders interviewed expressed their lack of enthusiasm with the system because of numerous previous activations within their AO by small animals. However, they did continue to utilize the sensors in a warning role.

2. Two rows of single concertina was felt to be adequate for protection by the Australian forces, since their bases were normally temporary in nature. A more sophisticated wire barrier could be added at a later time if the requirement developed. Command-detonated claymore mines were randomly placed between the two rows of wire.

3. Korean forces installed elaborate wire entanglements, utilizing protective, defensive, and supplementary barbed wire. Three bands of anchored triple-concertina were placed 30 meters apart. Trip flares were emplaced in the outer band, and two rows of command-detonated claymore mines lay between the outer and center bands. Locally fabricated box mines were emplanted along the beach approach to the base, inside the outer band of concertina. Supplementary wire bisected the concertina at 90-degree angles at a half-dozen places to channelize an intruder's attempts at infiltrating the wire.

4. An observer was posted in the observation tower above the ROKA TOC at all times and was equipped with a starlight scope at night. He had continual wire and radio communications to all points on the base. The Korean base utilized continuous night lighting of the perimeter; however, the RATF fire support bases did not.

FIGURE II-15. ROKA Artillery Parapets.

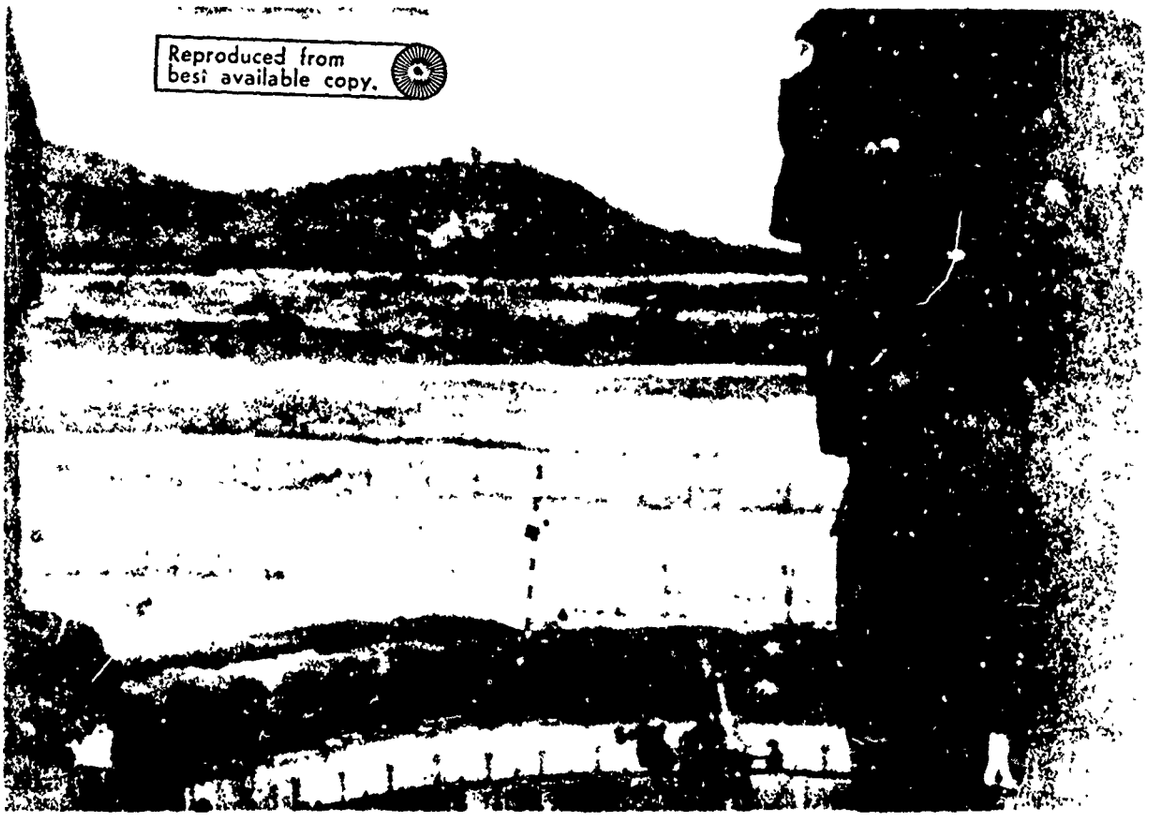


FIGURE II-16. ROKA Mortar Parapet.

d. Findings

(1) U.S. fire support bases were of various configurations - circular, triangular, rectangular, or conforming to contours of their sites; no one configuration appeared more advantageous overall [II-2a(1)(a); p. II-17].

(2) All U.S. personnel interviewed stated that facilities on the fire base should, ideally, be placed [illegible] [II-2a(2)(a)1; p. II-18].

(3) Factors which sometimes precluded underground construction were high water tables and lack of heavy construction equipment for excavation [II-2a(2)(a)1; p. II-18].

(4) The minimum overhead cover constructed at any U.S. base was three layers of sandbags [II-2a(2)(a)2; p. II-19].

(5) All U.S. bases [illegible] for bunker construction [II-2a(2)(a)4; p. II-[illegible]].

(6) Placement and construction of artillery emplacements was a major problem at all bases, particularly in low-lying areas during periods of heavy rainfall; extensive construction effort was used in stabilizing the gun pads for heavy artillery [II-2a(2)(b); p. II-20].

(7) All U.S. bases utilized [illegible] flares, claymore mines, and wire entanglements in varying [illegible] amounts, depending upon availability and the commander's [illegible] [II-2a(2)(c)1; p. II-26].

(8) All U.S. bases employed surveillance radar [II-2a(2)(c)4; p. II-29].

(9) Four of the seven U.S. commanders interviewed expressed a preference for perimeter lighting, while three were of the opinion that such illumination would compromise their positions and activities and indicated that they would be reluctant to use it [II-2a(2)(c)5; p. II-29].

(10) All U.S. bases evaluated used some type of electronic sensors as detection warning devices; flares, illum flares, and ARA flares were also widely used [II-2a(2)(c)6; p. II-29].

(11) There was much less underground construction at ARVN than at U.S. fire support bases, due mainly to lack of heavy construction equipment [II-2a(2)(a); p. II-30].

(12) The RATF fire bases were temporary, were rarely occupied for longer than [illegible] weeks, and "hasty" construction methods were used in establishing these bases [II-2a(1)(a); p. II-33].

(13) The ROKA fire base interconnected all bunkers with trenchworks [II-2c(2)(a)2; p. II-34].

(14) All evaluated Australian and Korean fire support bases had underground sleeping quarters [II-2c(2)(a)1 and 2; p. II-34].

3. Objective 3 - Defensive Tactics and Techniques

a. U.S. Forces

(1) Command Responsibilities

At all seven bases evaluated, the senior officer in residence was responsible to higher authority for defense of the fire support base. At six locations the responsible individual was an infantry battalion commander; however, the reaction force (usually a reconnaissance company) commander had been appointed base defense coordinator by the battalion commander. As such, he was responsible for the day-to-day manning of the perimeter defenses, upgrading and maintenance of fighting positions, weapons inspections and, in general, assuring that all defenses were in a state of readiness should an attack occur. At the remaining base, where a half-battery of medium artillery (reinforced) was stationed, the assistant battery commander was the base commander.

(2) Internal Security Procedures

(a) All the U.S. fire support bases evaluated had established internal security procedures for both day and night and used observation towers, roving guards, perimeter sentinels and supervisory inspections. Normally the perimeter bunkers and fighting positions were more heavily manned at night than during daylight hours. For example, one base employed three perimeter sentinels during the day, but from sunset until morning light, 12 perimeter positions were each manned by two individuals, each armed with an M-60 machinegun. Additionally, an alert force of two infantry squads patrolled the inside perimeter and a jeep-mounted machinegun was available for immediate reinforcement at all times.

(b) Practice alerts were conducted periodically at all the bases evaluated. The frequency of these practices ranged from weekly, at one base, to a maximum of two each night, at another. Post-alert critiques were conducted to correct deficiencies in alertness, knowledge of range cards, placement of claymore mines, communications reliability, maintenance of weapons and ammunition, and knowledge of alert procedures. Organic artillery readiness procedures and reaction forces were checked as well.

(c) One base had installed internal wire barriers of concertina and chain-link fences to provide "islands of defense". The interior of the base was fenced into sections with breaks in the wire to allow normal passage of base personnel. An enemy who breached the perimeter defense in darkness would have been slowed by the internal wire because of his unfamiliarity with its location. At another base, single concertina was spread just inside the berm, allowing only small gaps in the wire for the perimeter guards to pass through. The commander felt that an attacker, after breaching the outer wire, would be moving rapidly across the berm onto the base, and in his haste would not expect another barrier of concertina, especially on the inside of the berm.

(3) Alert Procedures

All of the bases evaluated had established procedures for the calling of alert conditions. Sirens were available and utilized to signal an alert. A rising and falling tone was an indication to take cover; steady tone [illegible] positions; and several short blasts of the siren signified all clear. A red star cluster was the alternate means for signalling an alert. A green cluster indicated cease fire. These signalling means were controlled by personnel of the tactical operations center or fire direction center. Sirens were all tested daily to insure their continued availability. TOT's called for initiation of 360-degree close-in artillery fires until positive identification of [illegible] determined. The primary means of [illegible] assessing electrical lighting on their perimeters, and the alternate means, was by mortar fire. All bases had 81mm mortars available, and one base had a 60mm mortar which was [illegible] illumination rounds. For those bases possessing the 105mm howitzer, illumination rounds were also available [illegible] regulation and further implemented by [illegible] through written directives. Periodic briefings on the rules of engagement were conducted at the bases. Personnel were reminded that permission to fire outside the perimeter must come from the TOC personnel after notification of a suspicious act, movement, or noise outside the wire.

(4) Defensive Artillery Techniques

The fire support plan for those fire support bases evaluated included long-range fires, close defensive fires, and fires within the position area. The plan also included all available mutually supporting units and units within the position and employed a variety of projectiles and fuzes. All FSB commanders stated that the most effective projectile for self-defense against ground attack was the "beehive" round. Maximum effect from this round was achieved from bases located

in relatively level terrain. The second most effective round was the improved conventional munitions (ICM) round, normally referred to as "firecracker". It was fired at high angle using a low charge, and, depending upon wind conditions, the bomblets can be made to impact upon the firing positions. High-angle ICM close defensive targets were registered when planning the base defense. An artillery technique was the use of "killer junior". This is a high-explosive (HE) projectile with the time fuze set at minimum time, fired at minimum howitzer elevation. The distance from muzzle to detonation varies directly with the charge and time fired. The effect of killer juniors is maximized when firing on level terrain, but they can be fired from mountaintop bases with the effect of lobbing the round downhill. When registering killer junior each section chief developed a range card showing the charge and fuze settings required to obtain each 100-meter range increment from 300 to 700 meters.

(5) Availability of Artillery and Close Air Support

Mutually supporting artillery fire was available at six of the seven bases evaluated. In all cases this mutual support was from other U.S. fire support bases of the parent brigade organization, simplifying fire support coordination. Prior to the fire base establishment, defensive supporting fires were registered by the supporting unit and further refined once the new artillery unit was emplaced. Mutual fire support coordination was performed by direct communications between the supporting and supported fire base. Close air support and helicopter gunship support was available to all bases through normal air request channels. One base had the capability to direct Air Force gunship support during inclement weather through the use of surveyed radar transponder emplacements. Through the use of an airborne radar transceiver the gunship crew were able to determine their position in relation to the fire base and carry out fire missions even though unable to maintain visual ground reference.

(6) Employment of Patrols

Patrols of some type were employed by all seven of the U.S. bases, although in one case the RVN district Popular Forces provided this function to the half-battery-sized fire support base. At this base, tactical communications were relayed (and interpreted) between the patrol and base by the district headquarters. This headquarters was adjacent to the fire base and maintained both wire and radio communications between the two units. Organic troops were used for patrolling at the six battalion-size fire support bases and regularly patrolled out to a distance of 4000 meters from the base. Various patrol techniques were used depending upon the terrain encountered and the nature of the enemy threat. In

the event of heavy enemy contact with the patrolling force, ready reaction forces were available on or near the fire base and could be airlifted by helicopter and inserted for reinforcement. One base was the headquarters of an armored cavalry squadron, and patrolling was performed by dismounted infantry, mechanized infantry, armored vehicles, or helicopter scout-gun teams and/or a combination of all those assets. One commander stated that he had seen captured enemy documents indicating that the use of patrols had altered enemy access and infiltration routes by denying them formerly used routes and concealment by darkness. Active patrols within the area surrounding the fire support base have prevented enemy reconnaissance of the base or the positioning of sappers and other assault troops near the base during daylight hours for a surprise attack under later cover of darkness. All the bases deployed three patrols per day under normal conditios and their intervals were randomly changed to prevent the enemy from observing an established time schedule of combat troops departing the perimeter.

(7) Integration of the Overall Defense System

(a) Figure II-17 illustrates the integration of detection and warning devices, obstacles, barriers and defensive fields of fire at a typical U.S. fire support base. While this is typical, variations were found from base to base, depending upon emplacement techniques, availability of construction materials, desires of the local commander and directives of higher headquarters; generally the bases were quite similar, other than in shape. The following detection, warning, and surveillance devices and obstacles were employed at the bases evaluated:

1. Unattended ground sensors

2. Wire entanglements of following types:

   a Concertina

   b Triple concertina

   c Barbed Tape concertina

   d Double apron fence

   e Low wire fence

   f 4-strand fence

   g RPG wire (cyclone fence)

   h Tanglefoot

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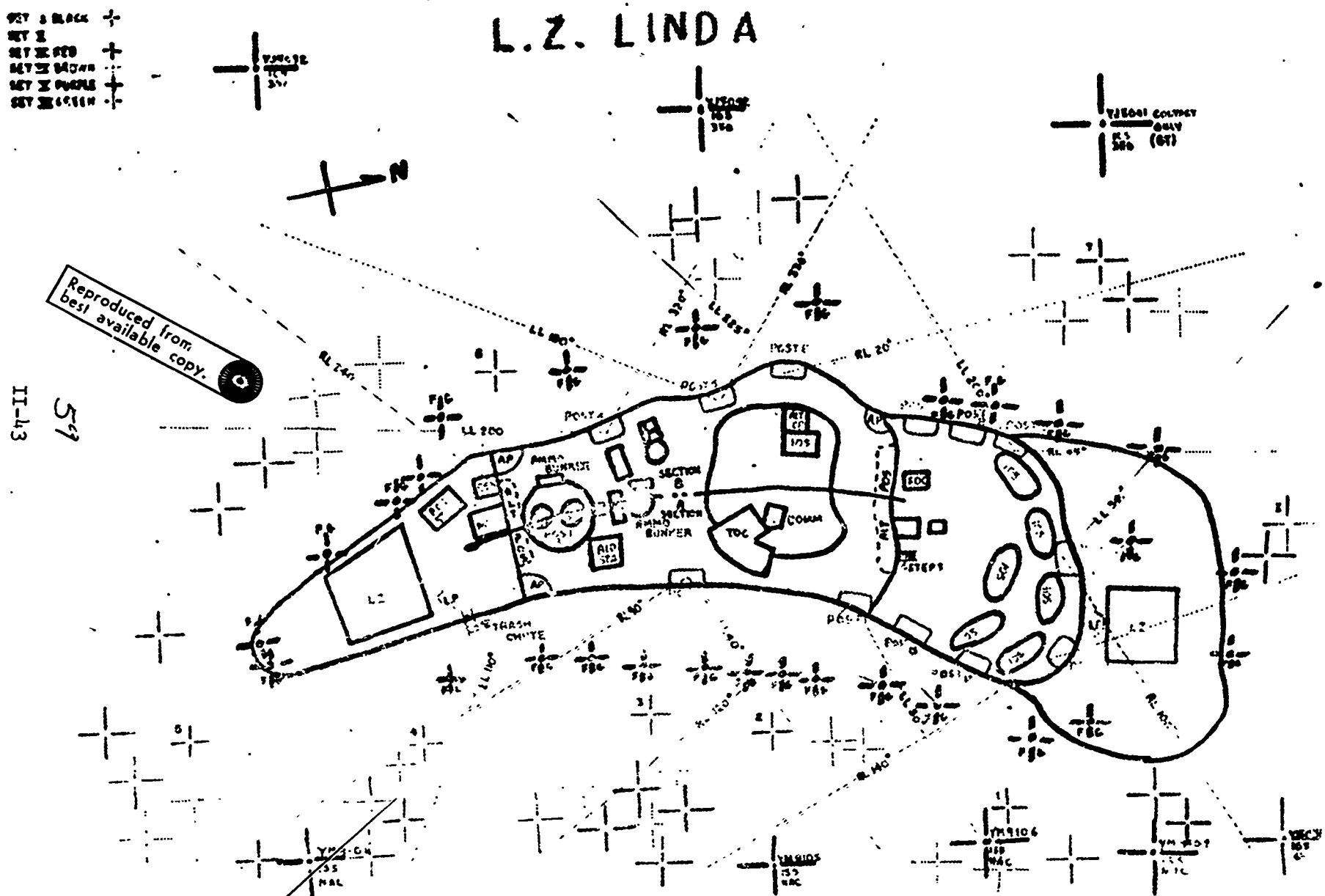


Figure II-17. Integration of Fields of Fire.

3. Surveillance Radars of following types:

a AN/PPS-4 Surveillance radar

b AN/TPS-25 Surveillance radar

c CSR-III Camp sentinel radar

d AN/MPQ-4 Counter-mortar radar

4. Night Observation Devices:

a Starlight scope

b Integrated observation system (IOS)

c Electronic perimeter lighting

5. Conventional munitions:

a Trip flares

b Hand-held flares

c Artillery flares

d Claymore mines

6. Chemical munitions (see Annex C for descript[illegible] explanation/employment techniques):

a CS launcher

b Fougasse

c Flame mine

d Husch flare

e ARA markers.

Imaginative field expedients were also helpful in the barrier and detection role when thoughtfully planned and fully integrated into the overall defense.

(b) Small arms, automatic weapons, and defensive artillery techniques played a major role in the defense of the fire support base when planned in conjunction with the aids mentioned above. Fields of fire were developed at bases so as to utilize assigned weapons to their

best advantage, while coordinating firing limits with barriers and the terrain. All the bases used range cards within the fighting positions to show location of claymore mines controlled from that bunker. Five of the seven utilized range cards for individual bunkers, showing firing sector limits, placement of claymore mines, chemical munitions, range to landmarks, and deadspace within the field of view (Figures II-18 and II-19). Information from the range cards was then consolidated on a map overlay of the fire base, showing obstacles, final protective lines of fire, artillery registrations, elevations, etc., to provide TOC and FDC personnel with a defensive "road map" in the event of ground attack.

(c) Although all the bases employed unattended ground sensors, two bases had their sensors monitored at higher headquarters. Of the five bases provided with portatales for monitoring sensors, three located them in the battalion TOC and two preferred them to be in the artillery FDC. Only one base fired artillery on sensor activations without confirmation by other means such as radar or positive identification by patrols or visual sightings using night observation devices.

(d) Husch flares and ARA markers were useful to mark the base perimeter for helicopters and close air support in the event of a ground attack at night. Firepower could then be directed from the ground, utilizing the markers as reference points for the aircraft crews. The Husch flares also provided perimeter lighting for those bases not possessing perimeter floodlights or in the event of loss of electric power.

(8) Personnel Defensive Training

Only two of the seven bases conducted cyclic unit training. After rotating personnel from the field through a short in-country rest and recuperation period, they were then moved to the fire base to perform duties as the security force. Unit training was conducted concurrently and included range qualification, zeroing of individual weapons, small arms maintenance, patrolling, airmobile tactics, mines and booby-traps, use of night observation devices and night defense. By rotating the units through the fire base in this manner, each individual was afforded training on a monthly basis. All personnel on each of the seven bases participated in the practice of fire base alerts conducted at the discretion of the on-site commander. One fire base commander utilized only rotatees, personnel with temporary medical profiles, and those departing on rest and recuperation leave, for internal security duties. He felt that these personnel, particularly the "short-timers", were more apt to be alert during defensive duties than were the other troops.

b. ARVN Bases

(1) Command Responsibilities

Five of ten bases evaluated were solely occupied by an

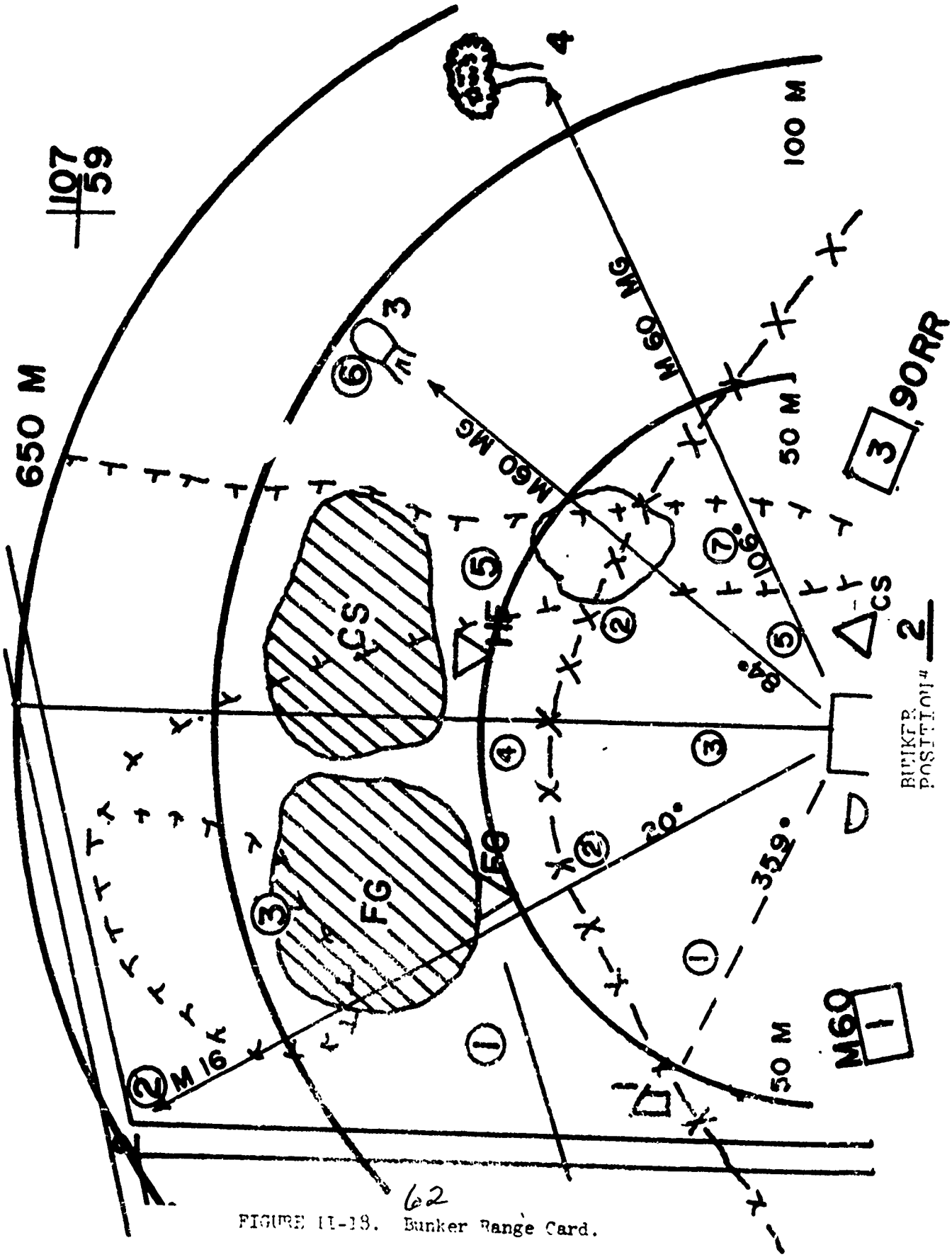


FIGURE II-18. Bunker Range Card.

Deadspace:

Left Limit of Sector: Az 359° Landmark GUARD SHACK

Right Limit of Sector: Az 106° Landmark TREE

FPL (Final Protective Line) Az 106° Landmark TREE

PDF (Principal Direction of Fire): Az 20° Landmark RD JUNCTION

Az 84° Landmark GRAVE

Az ___ Landmark _____

M-79 Targets: Numbered from left to right: (1) (2) (3) (4)

Claymore Mines: Numbered from left to right: (1) (2) (3) (4)

Fougasse: Area Covered

Location of Barrel

CS (E8 Launcher): Area Covered

Location of Launcher

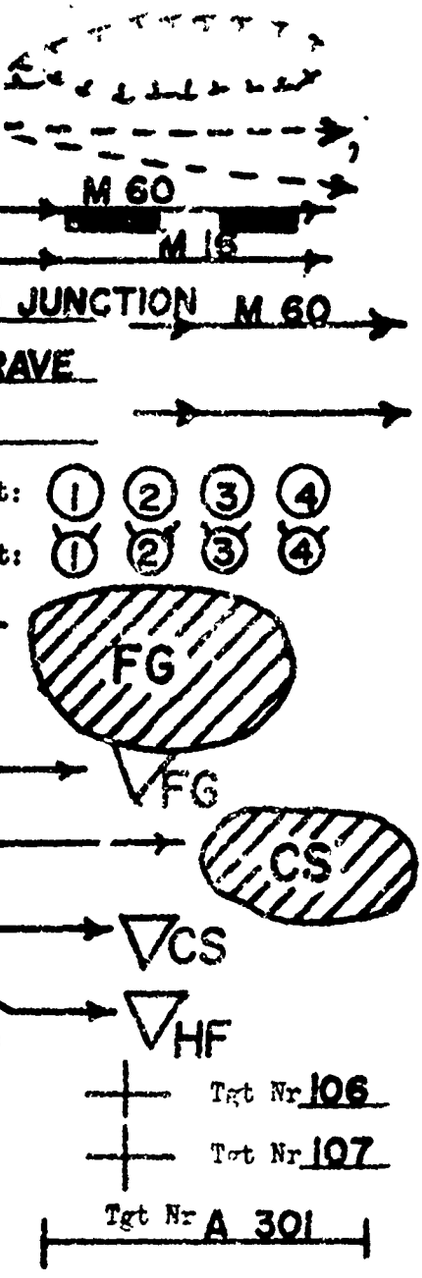
Husch Flare: Location of Husch Flare

Flame Pot (ARA Marker) Location of Marker

Arty/Mortar Def Targets: Az 28° Range 600M Tgt Nr 106

Az 59° Range 650M Tgt Nr 107

FPF (Final Protective Fires): Az 11° Range 70M Tgt Nr A 301



LANDMARKS

Nr	Description	Azimuth	Distance
1	GUARD SHACK	359°	20 M
2	ROAD JUNCTION	20°	150 M
3	GRAVE	84°	83 M
4	TREE	106°	110 M

Defensive Wire: Mark inner limit

FIGURE II-19. Bunker Range Card Legend.

artillery unit, whose commanders were responsible for physical security as well as for combat fire support to area defense organizations within range of the base. Three of these units were Regional Forces and, as such, were responsible to their province chiefs. The remaining two were ARVN units assigned in a general support role of the geographical area. Five of the bases were commanded by an infantry battalion or regimental commander with artillery on the base in direct support of the infantry unit's mission. In all cases the senior officer in residence was responsible for the physical security and defense of the fire support base.

(2) Internal Security Procedures

All bases had established security procedures for both day and night operations. Three of the bases stationed one man in a tower to provide all-around observation and early warning to the base in the event of hostile action. Also, during the daytime, a full complement of personnel manned the tactical operations center, and the perimeter defense and artillery personnel were readily available. During darkness all the bases employed from two to four personnel in each of the perimeter bunkers and a reduced force in TOC, to include a responsible duty officer and FDC alert personnel in the event of an artillery mission. Communications to individual perimeter bunkers from the TOC was available at only four bases. Individual commanders cited this shortcoming as due to the lack of communications equipment through their supply systems.

(3) Alert Procedures

Three bases had electrically operated sirens as alert warning systems. The remaining bases utilized gongs fashioned from 105mm shell cases, automotive brake drums, or similar expedients to sound the warning of an attack. Alert rehearsals averaged about one per week at these bases. Rules of engagement were promulgated by the ARVN Joint General Staff, but were similar in content to those of the U.S. forces. Since the number of personnel at the fire support base was normally fewer than at U.S. bases, the practice alerts were much less formal.

(4) Defensive Artillery Techniques

The ARVN bases evaluated did not possess the "firecracker" ammunition discussed previously, but did have defensive fires planned to utilize conventional high-explosive "beehive" and illumination rounds. These fires had been registered and were available in the fire direction center and at each firing position. The technique did not differ significantly from those of U.S. artillery units. Only three of the bases had mortar with which to provide base illumination if needed.

(5) Availability of Artillery and Close Air Support

Mutually supporting artillery was available to nine of the ten ARVN bases evaluated. Coordination was accomplished directly with the supporting unit, eliminating any possibility of delays encountered when requesting support through a fire support coordination facility. All artillery fire was coordinated with the local district headquarters to insure the safety of civilians who might have been within the fire zone. Normal request channels were utilized in requesting immediate close air support missions.

(6) Employment of Patrols

Patrols were utilized much as those of U.S. forces, with the exception of the RF artillery units who did not have infantry assets available. Under these circumstances the fire base coordinated with the local district headquarters, who regularly had RF/PF patrols or other type forces within the immediate vicinity. The ARVN regular forces normally conducted their patrols with company-size units and varied their frequency, area covered, and distance from the base, in order not to establish patterns.

(7) Integration of the Overall Defense System

The integration of barriers, surveillance systems, and firepower were generally well planned at each of the bases, to afford the maximum advantage of equipment and materiel for the particular terrain and enemy situation. The two regimental fire bases had the more complete defensive systems; whereas, the least adequate were the two-howitzer-section RF installations. This appeared to be a direct result of the amounts of supplies and equipment available throughout the supply system. Divisional elements of the ARVN regular forces had a more responsive supply system with more items available than did the smaller units. The greatest deficiency observed was the condition of wire entanglements surrounding the bases. For the most part, the wire had been properly installed initially, but had since become weakened by rust and overgrown with grass and weeds. As previously mentioned, these conditions seemed to exist with regard to the size of the unit on the base - the large bases having the better wire, and progressively worsening to the smallest bases. When queried on this point, the commanders of the small units replied that materials were not available to them through normal supply channels to upgrade their defenses. These conditions may also be related to the role played by U.S. advisors, and their ability to obtain materials through the U.S. Army supply system, since it appeared that the better constructed and defended bases were those which had U.S. advisors in residence. All bases utilized some type of unattended ground sensor system with monitoring performed at their higher headquarters. Four of the bases employed

surveillance radar organic to the infantry element headquartered at the site, and six had starlite scopes available for covert night observation. Artillery, automatic weapons, and small arms fields of fire were preplanned for maximum protection in the event of attack, although few of the bases had produced the range cards for individual fighting positions that were in use at U.S. bases.

c. FWMAF Bases

(1) Command Responsibilities

(a) At the three RATF fire support bases evaluated, the senior officer was responsible for the defense of his unit and base. Since there were normally no infantry troops at the base, this officer was generally the artillery battery commander. He was responsible for coordinating with the supporting engineer unit during the construction phase, for the siting of emplacements and defensive positions, for clearing of the outer perimeter for fields of fire, for helipad construction, and the positioning of facilities within the base. Following the construction phase, he coordinated his artillery fire plan with the infantry unit with whom he was in direct support, registered his artillery and planned defensive fires for the protection of the base in the event of enemy attack. Finally, he was responsible for the troops under his command and to the maneuver force.

(b) The infantry company commander was responsible for the security of the ROKA fire base evaluated since he was the senior officer present (one rifle company and a 155mm artillery platoon), as well as for conducting offensive missions assigned by higher headquarters. The artillery unit was in general support of maneuver forces of the division operating within range of their howitzers and had their supporting fires planned by division artillery. The artillery unit commander was responsible to the fire base commander for duties assigned in defense of the fire support base.

(2) Internal Security Procedures

Both forces utilized day and night security personnel for warning and protection in the event of infiltration or attack. Because of their remote locations, all unidentified personnel approaching the base were suspect. The RATF base personnel were able to detect approaching people or objects easily during their normal daylight activities because of the relatively small size of the base, while the ROKA base stationed a sentinal in a tower with 360-degree observation of the surrounding terrain. During the hours of darkness two men were stationed in each of the perimeter bunkers at all evaluated FWMAF bases. Sirens were utilized to warn of an alert procedure, but only the ROKA fire base was equipped with electric perimeter lighting. The normal procedure for perimeter lighting at Australian bases was to request airborne flare

ships, meanwhile using hand-held flares until the aircraft arrived on station. In addition to complying with the published MACV rules of engagement, firing from the perimeter was permitted only upon order from TOC. Unannounced practice alerts were conducted by both forces at the discretion of the fire base commander.

(3) Defensive Artillery Techniques

Defensive fire techniques were essentially the same with both forces, with the exception of the RATF employing 105mm at the bases evaluated. The principles followed were to make **maximum effective use** of preplanned night defensive targets for harrassment and interdiction, thereby preventing the possibility of the enemy massing forces for an eventual night assault. Close-in fires were also planned for the use of high-explosive rounds to break up an assaulting element if required. Automatic weapons fire was coordinated with these fires for maximum target effectiveness.

(4) Availability of Artillery and Close Air Support

The RATF did not plan for mutually supporting artillery fires, since their deployment usually was not within range of other bases, but on some occasions it was available on request. Mutually supporting fires were available at all times to the ROKA base for defense or for night illumination. They also had defensive fires planned for other bases within range of their howitzers. Close air support was available to both forces from USA helicopters and Air Force assets through preplanned request channels. Forward air controllers were organic to the force headquarters and could be utilized in the defense effort.

(5) Employment of Patrols

(a) Patrolling in the vicinity of RATF fire support bases was performed by the supported infantry maneuver force. These patrols were frequently reinforced by the armored cavalry squadron and armored personnel carriers. Since the patrols prepared night defensive positions or patrol bases at some distance from the fire support base, the APC's provided a fast means of reinforcement to the artillery forces if needed. This patrolling was constant, utilizing large-size forces during the day and intelligence and ambush patrols during the night.

(b) The ROKA conducted platoon-size patrols to protect against infiltration and to provide fire base security out to 3000 meters. These troops were all organic to the infantry company at the fire support base and normally stayed outside the base for 10-15 days without returning.

(6) Integration of Overall Defense System

(a) Integration of surveillance, detection, and firepower were simplified at the RATF bases because of the small number of people and amount of equipment available. Also, since the base was temporary, defenses employed were not so elaborate as at many of the other bases evaluated and discussed in this report.

(b) In contrast to the RATF bases, the ROKA fire base was the most carefully planned and developed base of all types evaluated (all fire support bases of the ROKA 9th Division were constructed identically). The barbed wire entanglements were in good repair and inspected daily. They were installed exactly as specified in applicable field manuals. The perimeter was meticulously bared of all vegetation and policed daily, providing the clearest fields of fire of any of the bases. Because of its siting on a hillock, the base had excellent surveillance by natural means, night observation devices, and radar. There were no depressions or other terrain features in the vicinity that might provide concealment for a covert attack. Defensive fields of fire were well developed to coordinate small arms, automatic weapons, mortar, and artillery fires. Each fighting position was provided with a large range card in natural color, showing location of claymores, terrain features, aiming stakes, distances, and firing limits. There was also a slotted rack in the firing ports where an M-16 rifle could be positioned steadily, providing stops at the firing limits to either side of the bunker (Figure II-20). A radar and observation tower with spotlights was situated above the TOC, which had complete wire and radio communications to all defensive bunkers, mortar and artillery FDC, and the TOC. The perimeter was completely entrenched, connecting all fighting bunkers and sleeping bunkers and allowing freedom of movement if under attack. A 90mm recoilless rifle was integrated into the fire plan to provide direct fire capability toward the shoreline and high-speed avenues of approach. The weapon and its elaborate range card are shown in Figure II-21.

(7) Personnel Defense Training

The RATF conducted on-the-job training (OJT) in artillery and defensive tactics and techniques at the fire base. This was generally accomplished through the use of practice alerts with a comprehensive debriefing and critique by the artillery commander. In addition to the same type of OJT, the Koreans carried out a formal training program at the division base, as their troops were rotated between duties at the fire base and the division base camp. The training cycles occurred at approximately 6-week intervals. It was obvious to the evaluators that troop training was a continual process at the ROKA base from the excellent condition and appearance of weapons, police of the area, and the outstanding manner in which both the infantry and artillery personnel conducted themselves while on the base.

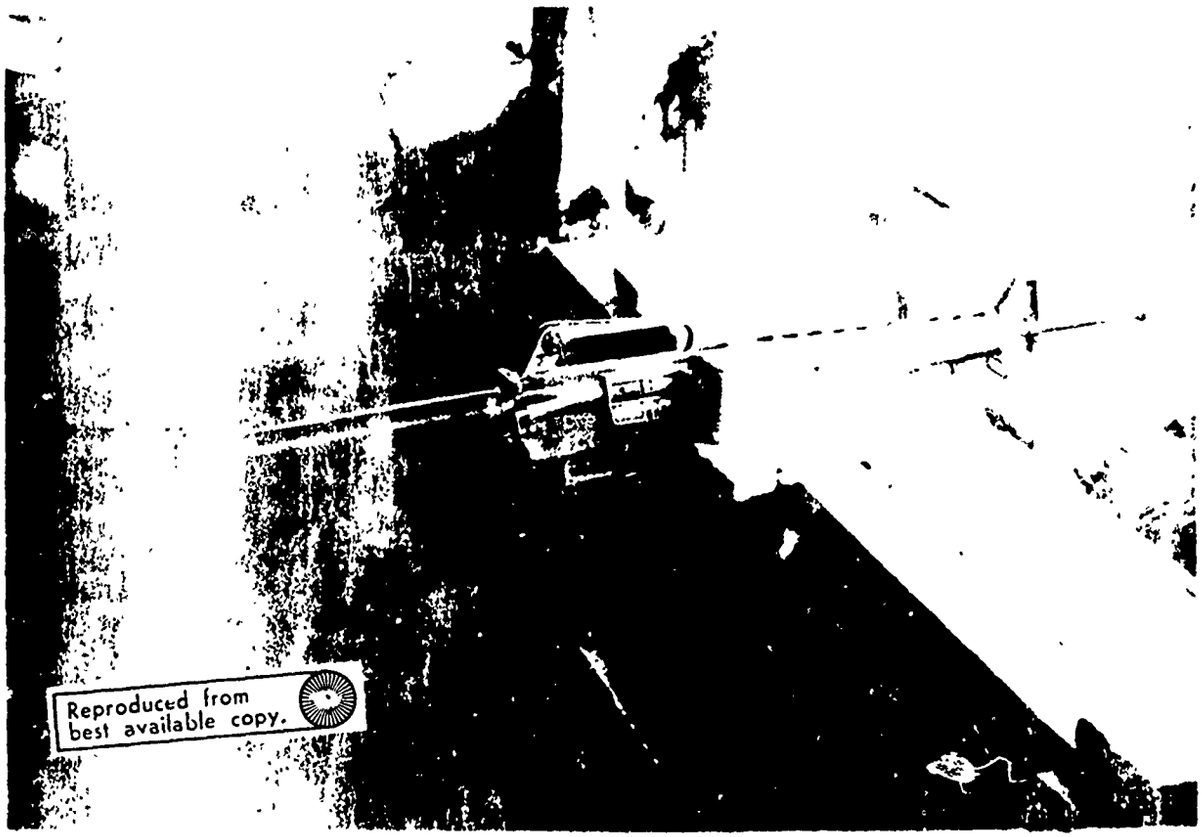


FIGURE II-20. ROKA M-16 Rifle Support.

FIGURE II-21. ROKA 90mm Recoilless Rifle Position.

d. Findings

(1) Practice alerts were conducted at all U.S. bases evaluated [II-3a(2)(b); p. II-39].

(2) One U.S. base installed internal protective wire to provide islands of defense within the base [II-3a(2)(c); p. II-40].

(3) At all U.S. bases evaluated sirens were utilized to signal alert conditions and were tested daily [II-3a(3); p. II-40].

(4) All evaluated U.S. bases had 81mm mortars to provide illumination, and some also used 60mm mortars and/or 105mm illumination rounds [II-3a(3); p. II-40].

(5) All fire support base commanders stated that the most effective artillery projectile for self-defense was the beehive round [II-3a(4); p. II-40].

(6) Patrols were employed at all seven U.S. bases evaluated [II-3a(6); p. II-41].

(7) One U.S. fire support base commander utilized only rotatees, personnel with temporary medical profiles, and those departing on R&R and leave for internal fire base security duty [II-3a(8); p. II-45].

(8) Bunker communications were available at only four of the ten ARVN bases evaluated [II-3b(2); p. II-48].

SECTION III

CONCLUSIONS

1. The role of the fire support base has been modified from the original concept of strictly offensive support to include that of protection of supply and communications routes and monitoring and interdiction of infiltration routes.

2. Optimum base configuration depends upon local environmental and tactical conditions; no single configuration can be considered standard.

3. Where terrain and water table permit, fire base facilities should be placed underground.

4. Bunker design should remain flexible enough to utilize available materiels (standard issue or natural), but must include adequate overhead protection from incoming rounds.

5. The most effective artillery projectile for self-defense is the beehive round.

6. Movement of the artillery pieces to a new base is generally the most important consideration in deployment and must take into account the possible need for fire support for offensive operations and defensive fires during the deployment and establishment of the fire support base.

7. It is essential that by nightfall of the first day of occupation at a new base, artillery pieces must be sited, minimal defensive wire emplaced, and overhead cover for all troops provided.

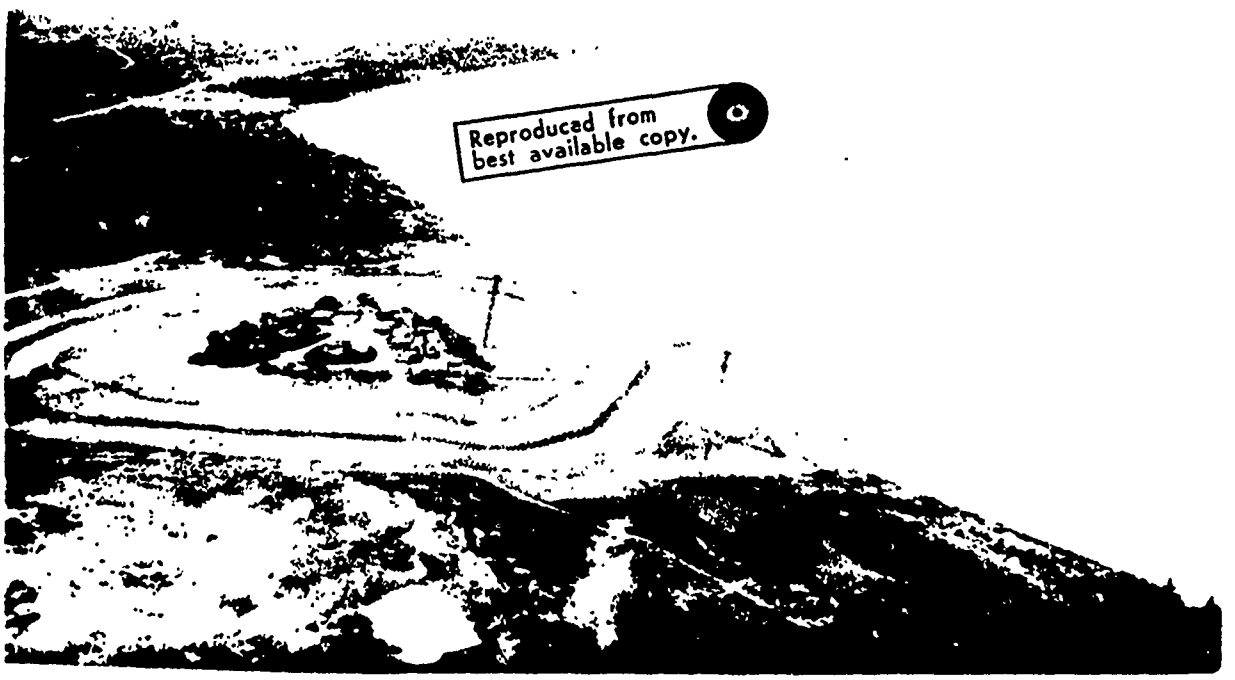
ANNEX A

FIRE SUPPORT BASE LAYOUT

equation

caused by recent

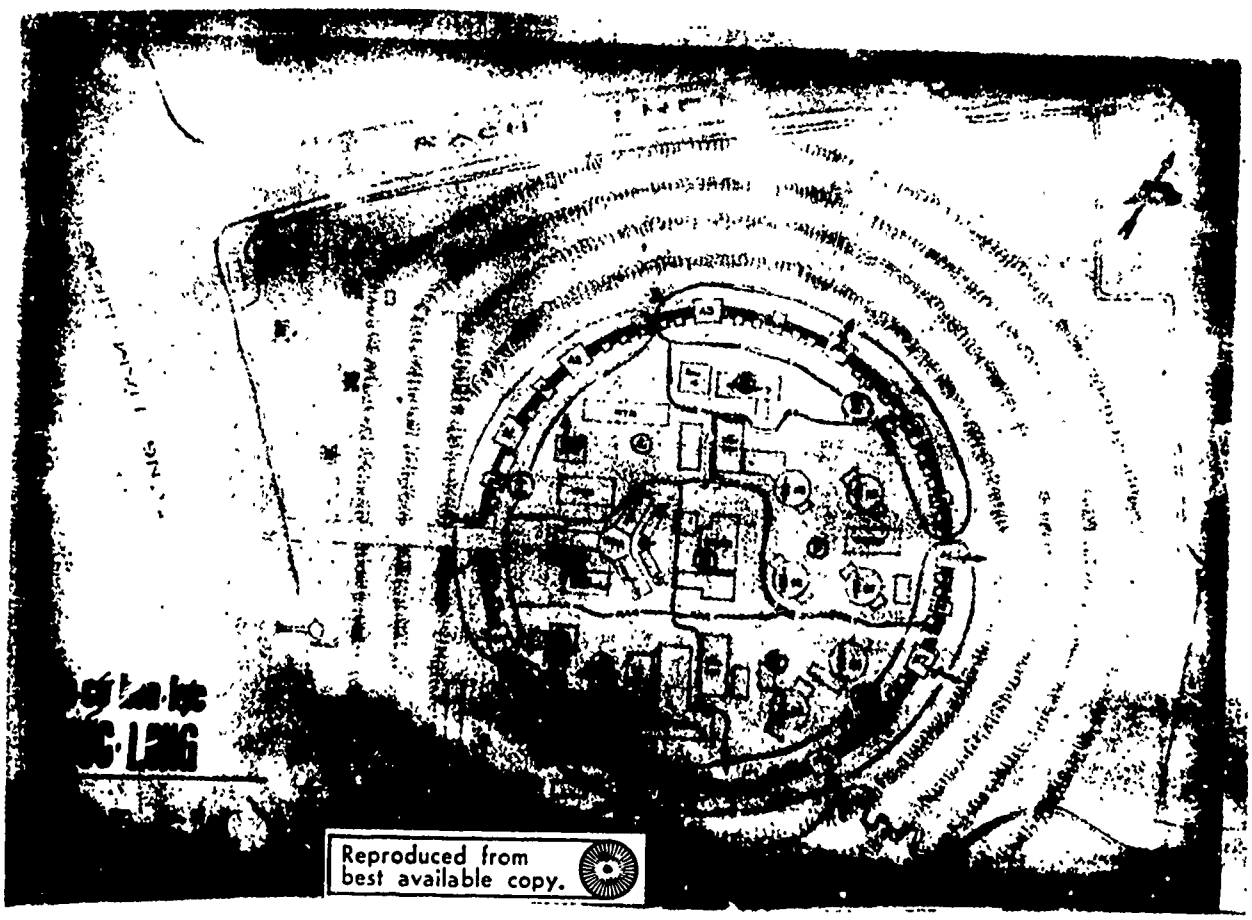
[illegible] infantry company with [illegible]

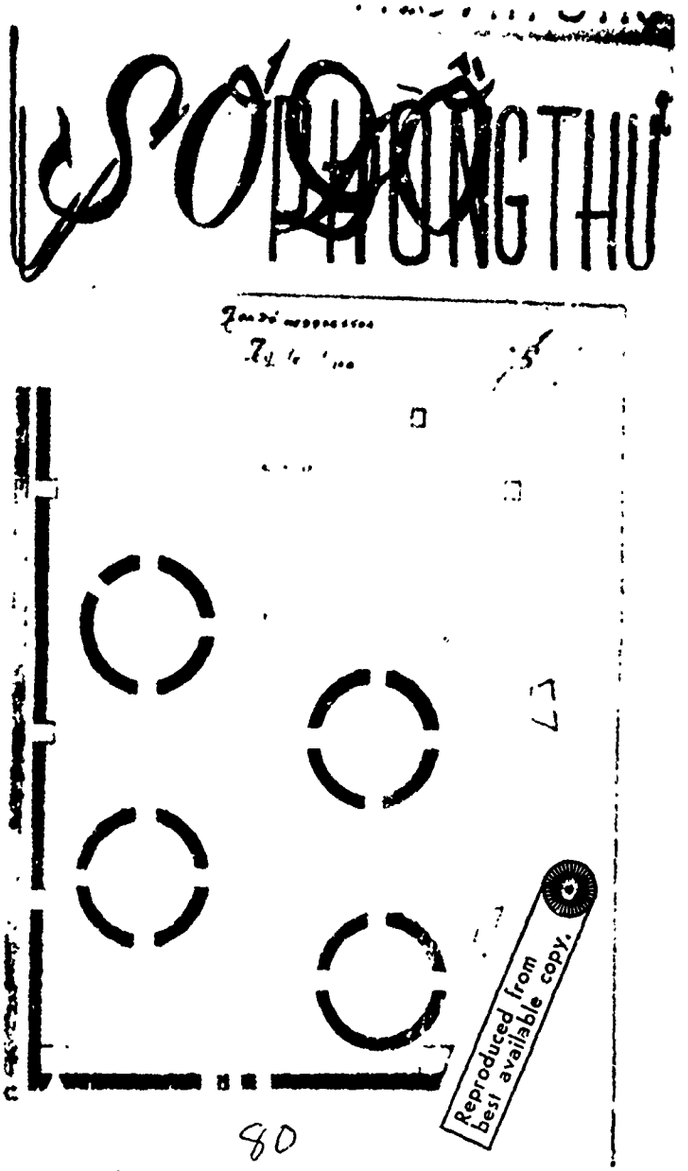


ROKA firebase showing proximity to coast.

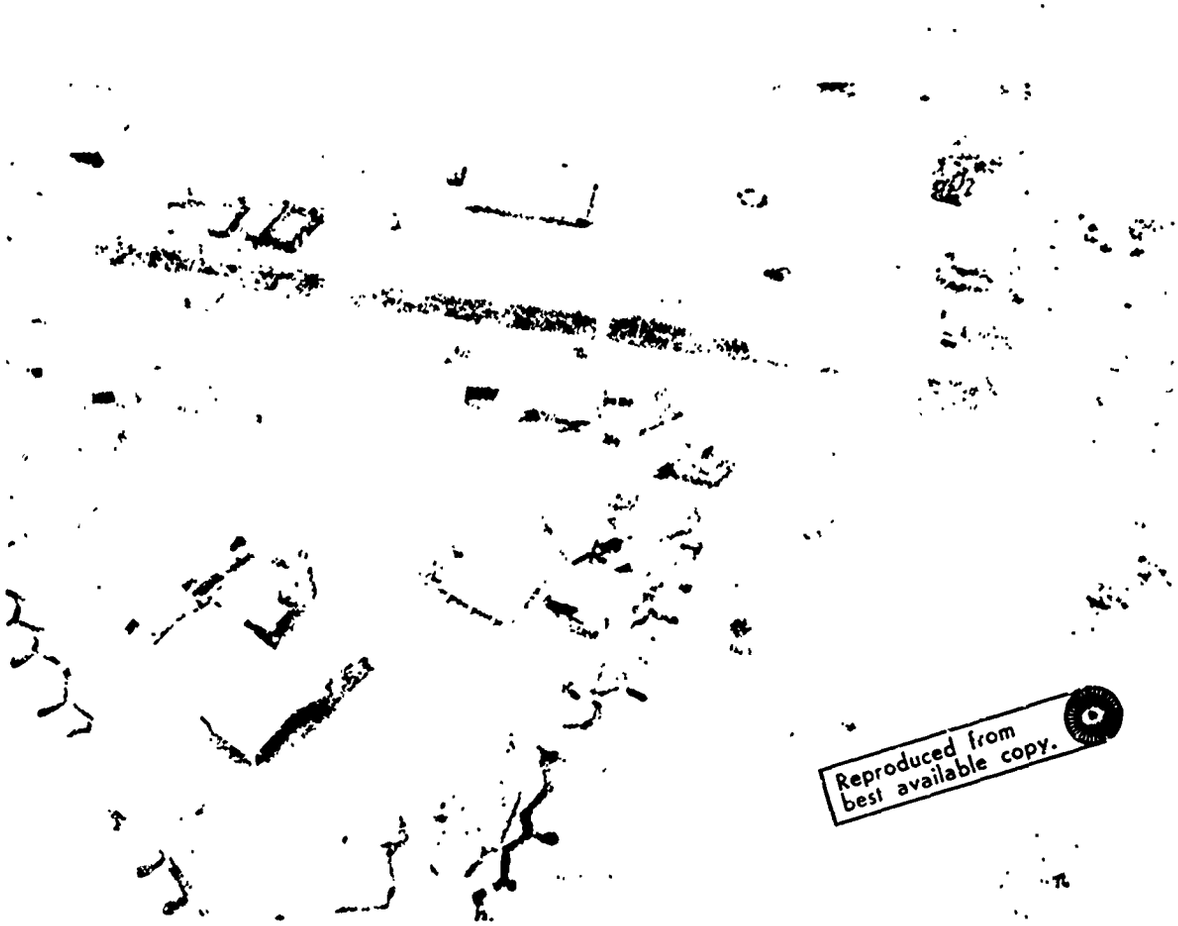
ATTW infantry regiment base with attached artillery battery.

78



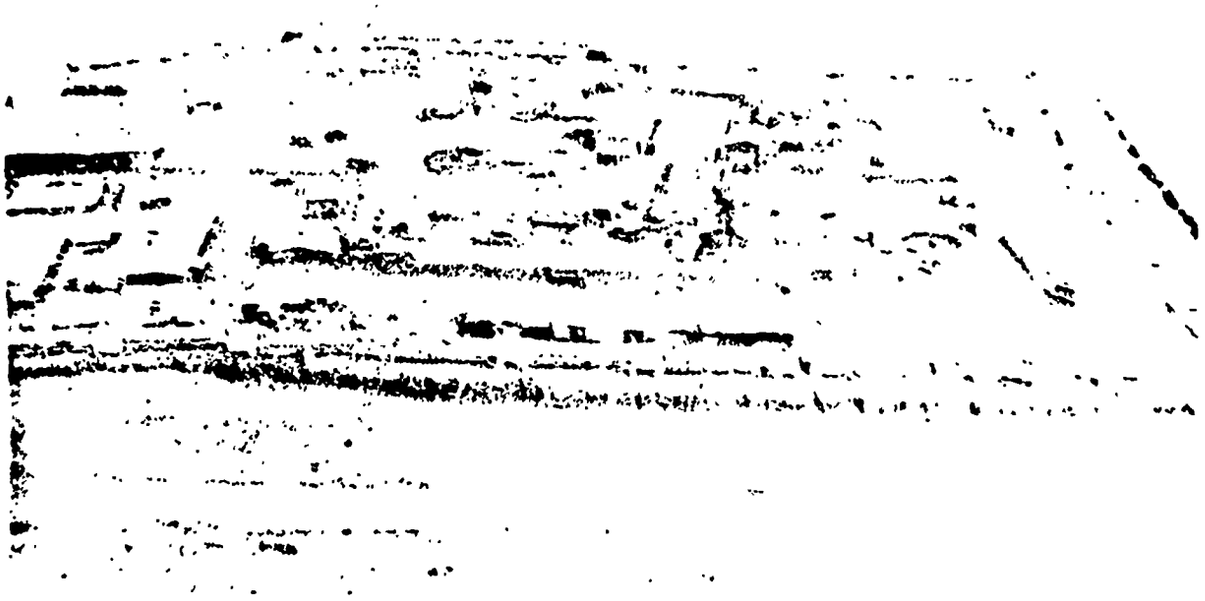


...latoon artillery base in the Mekong Delta.

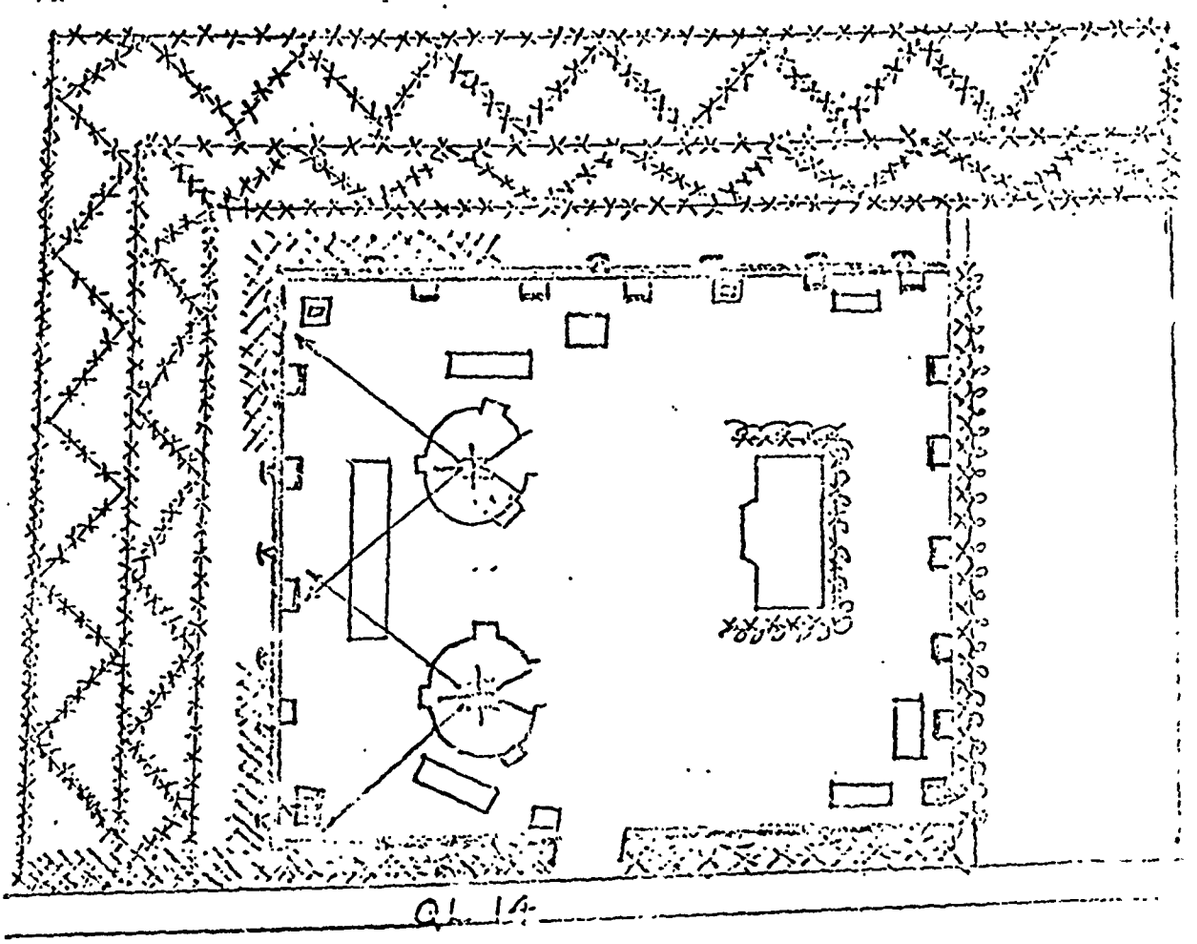


ARVN infantry platoon adjacent to previous firebase.

[illegible] base in the Mekong Terrace.



...latoons and one infantry platoon, in the



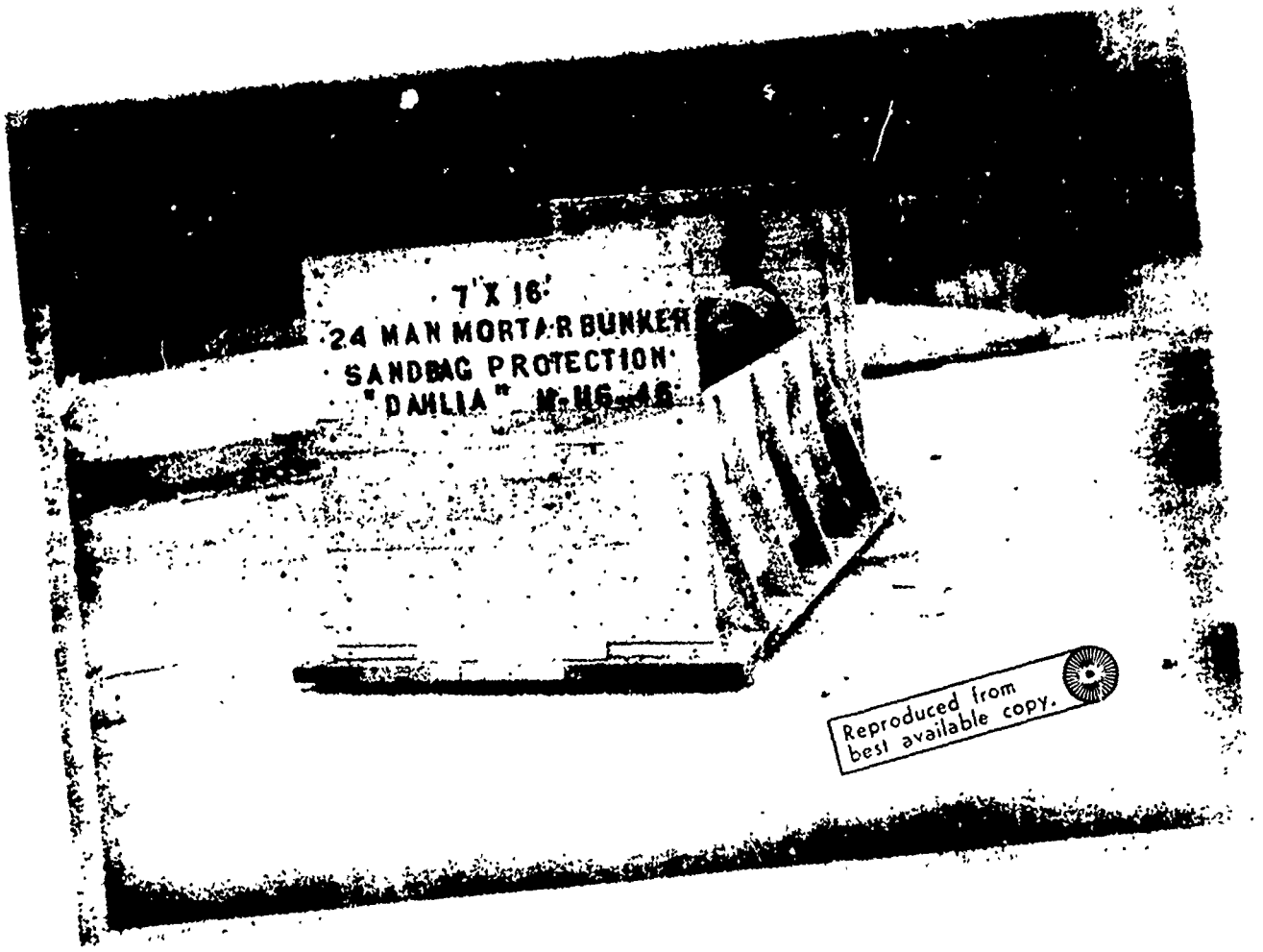
Tanglefoot ******
Concertina @@@@@@
Berm ≡≡≡≡≡≡
RPG Screen XXXXXX
Bunker □
Claymore ⌅
Reinforced Bunker ⧈

(ARVN) Two-Gun Medium Artllery Base in Central Highlands

84

ANNEX B

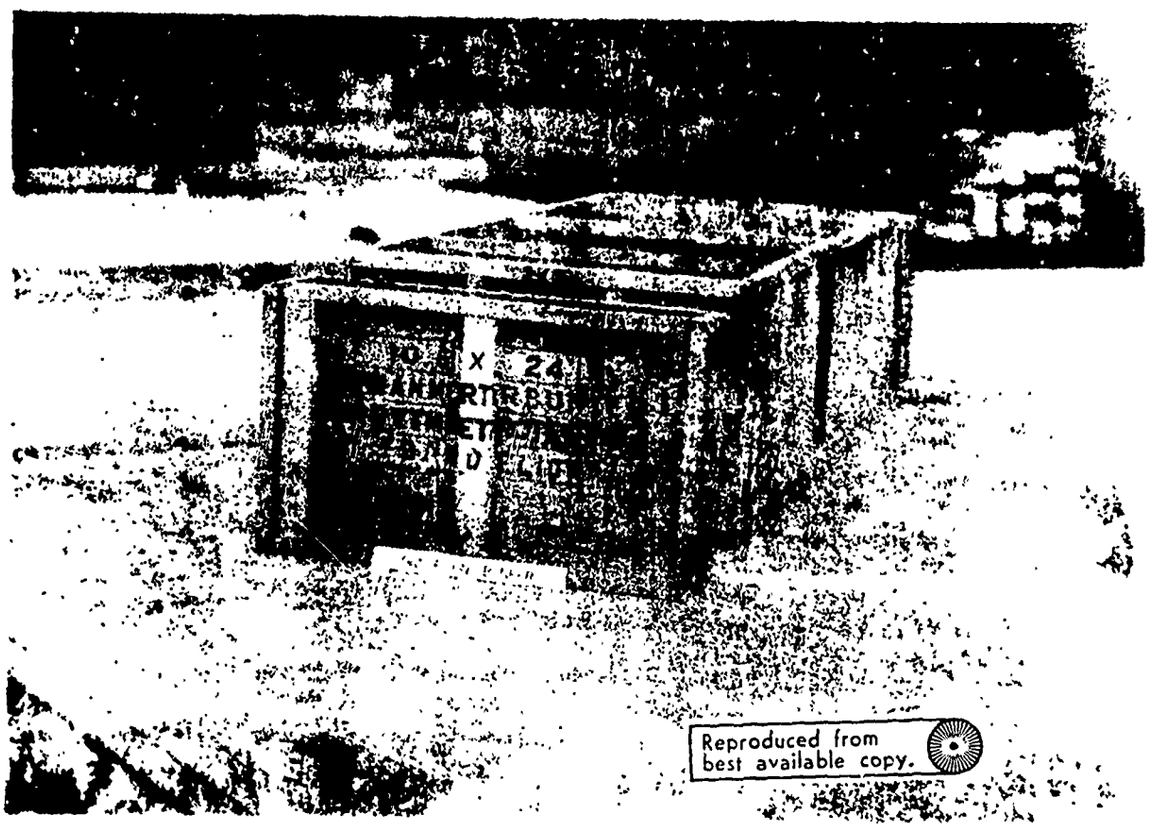
FORTIFICATIONS CONSTRUCTION

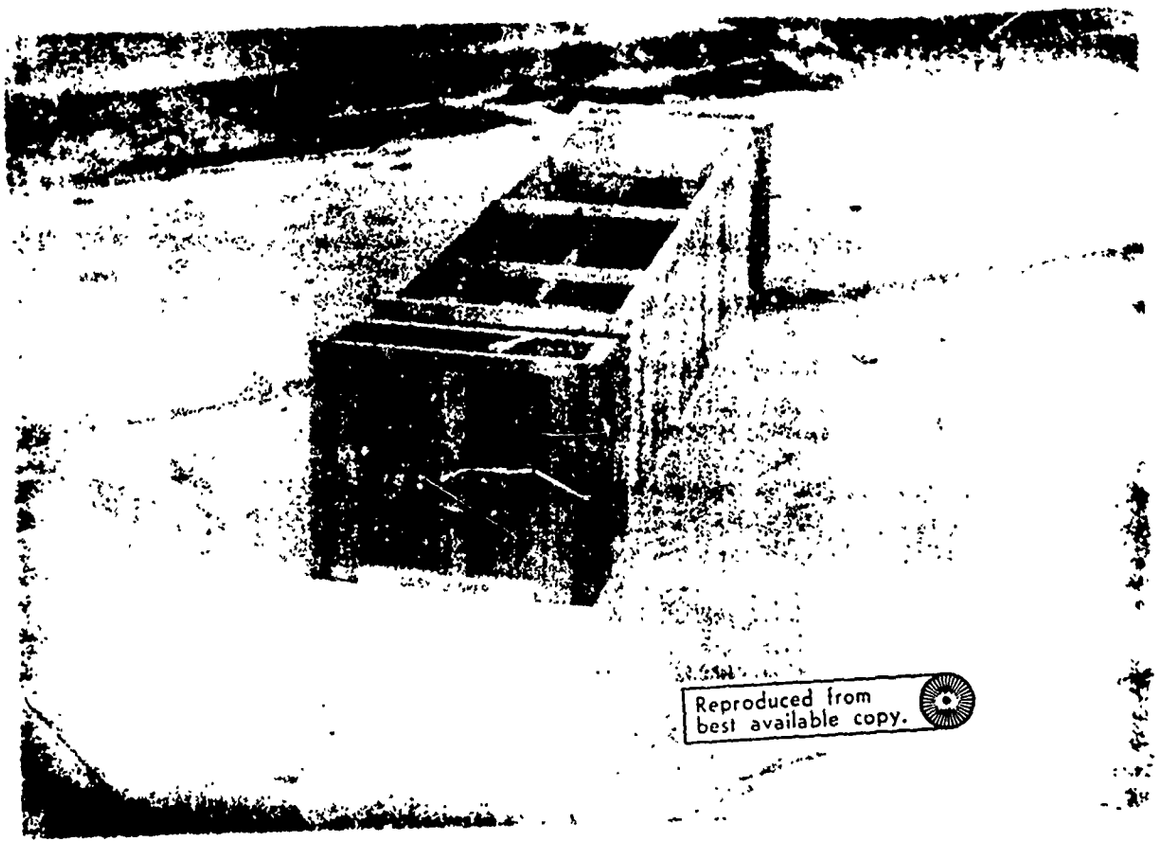


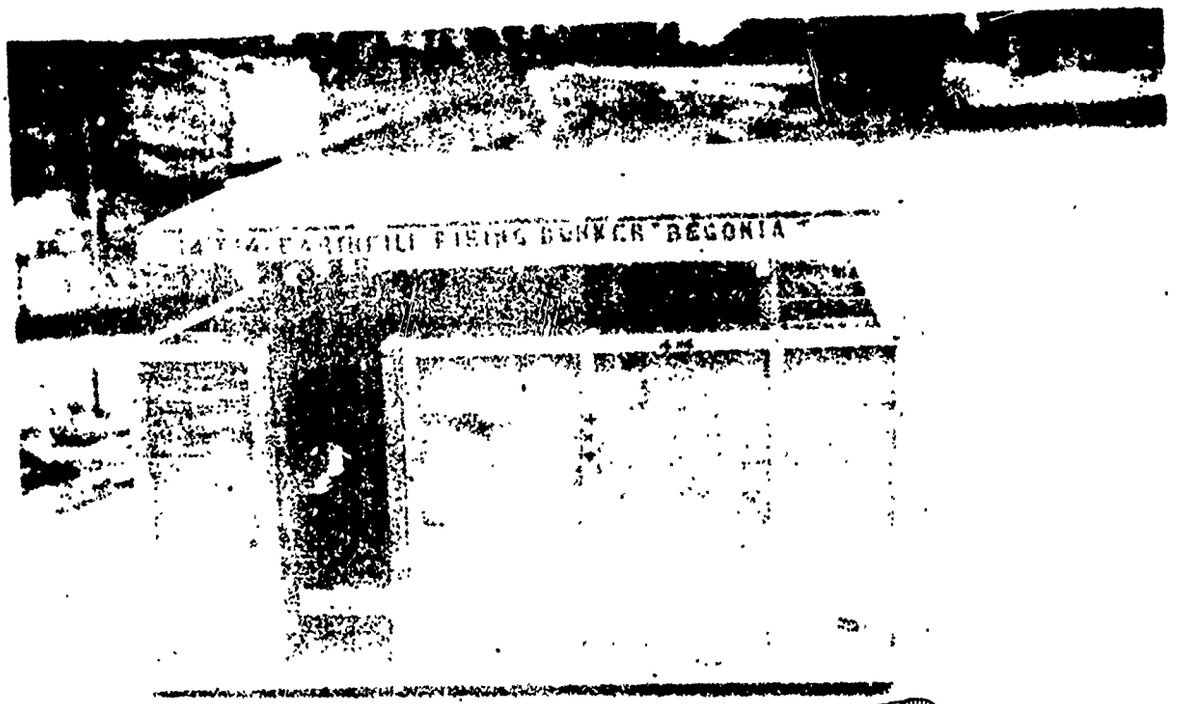
24-Man Wood Prefab Mortar Bunker: Used in the passive defense role.

* All U.S. bunkers depicted from page B-1 through B-7 may be employed above or below Ground.

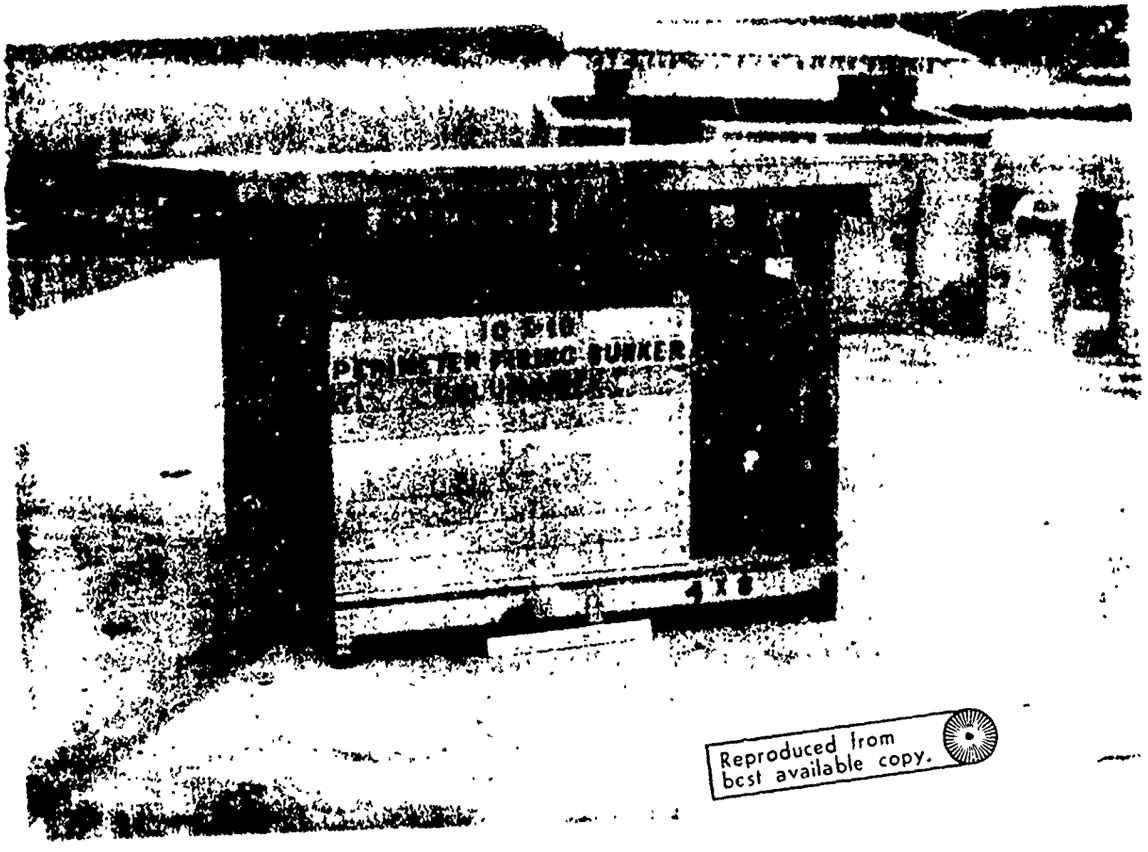
24-Man Wood Prefab Mortar Bunker: Used in the passive defensive role.

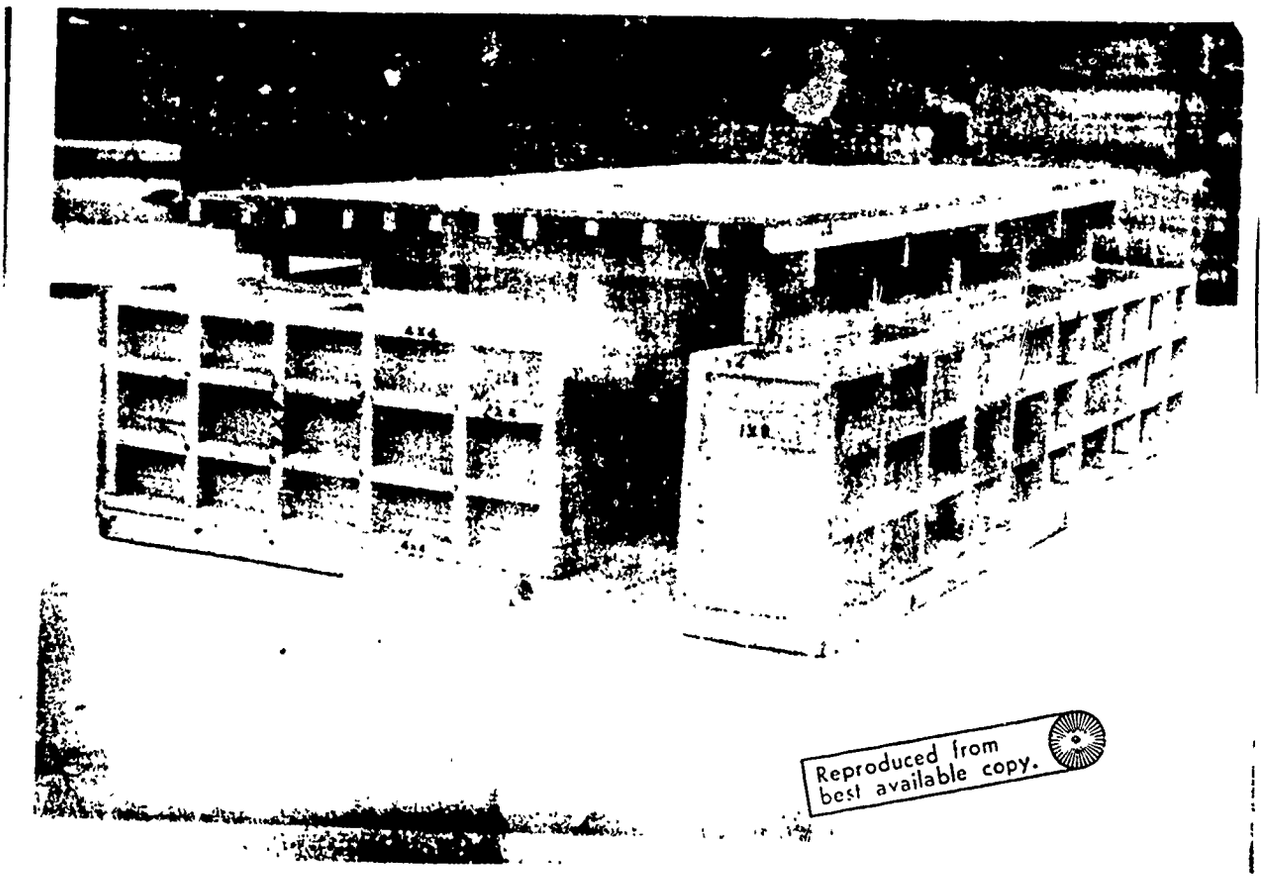




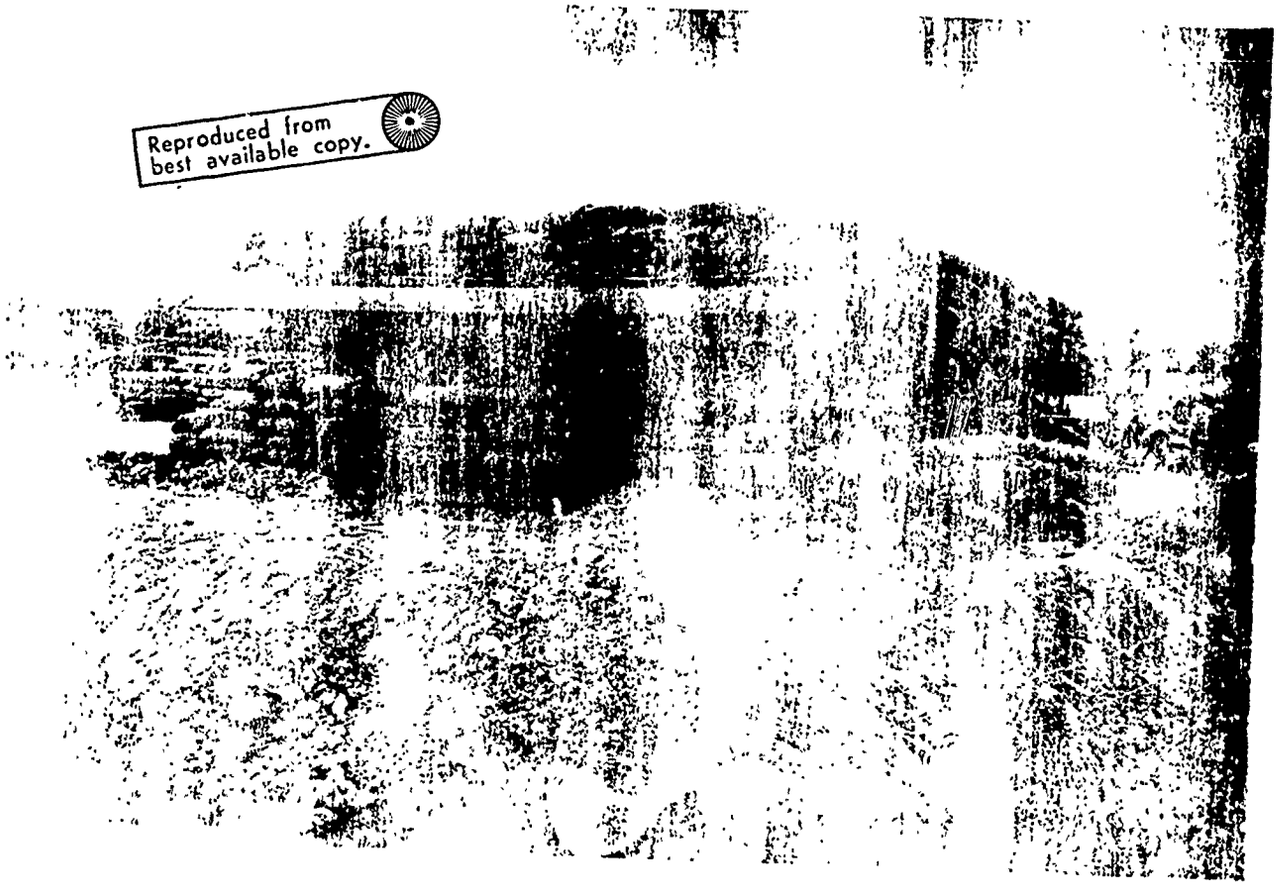


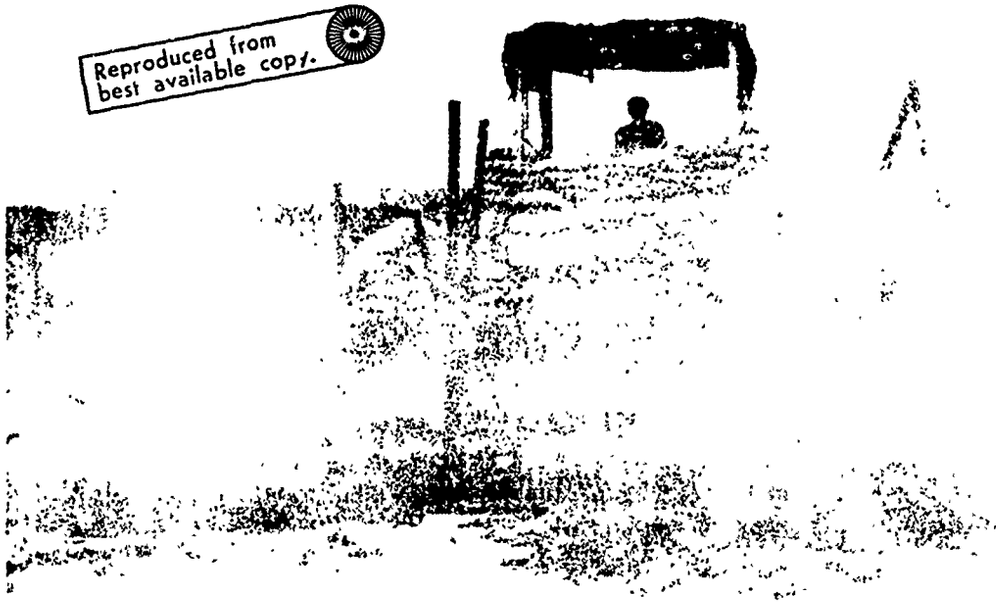
2 or 4-Man Wood Prefab Fighting Bunker: Used in perimeter defensive role.



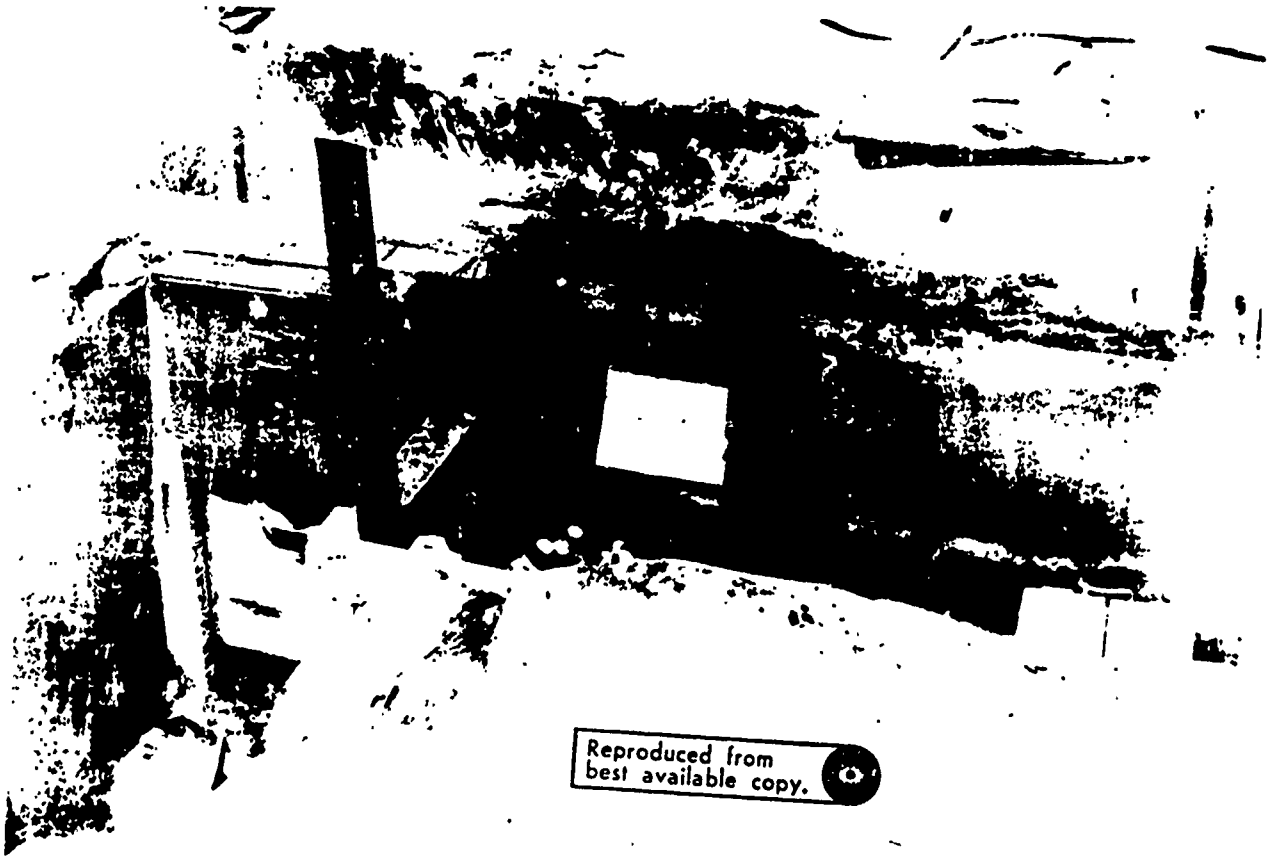


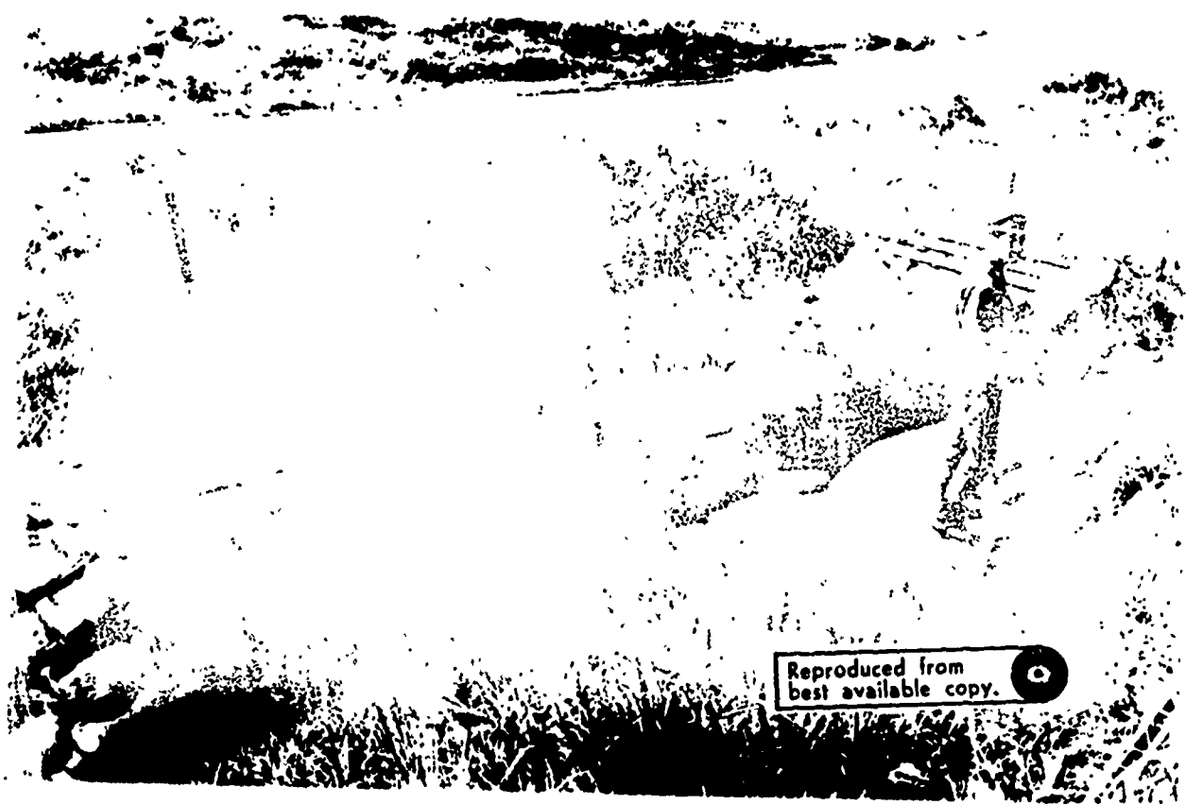
A Wood Prefab Command and Control Bunker: Used for artillery fire direction center or tactical operations center.



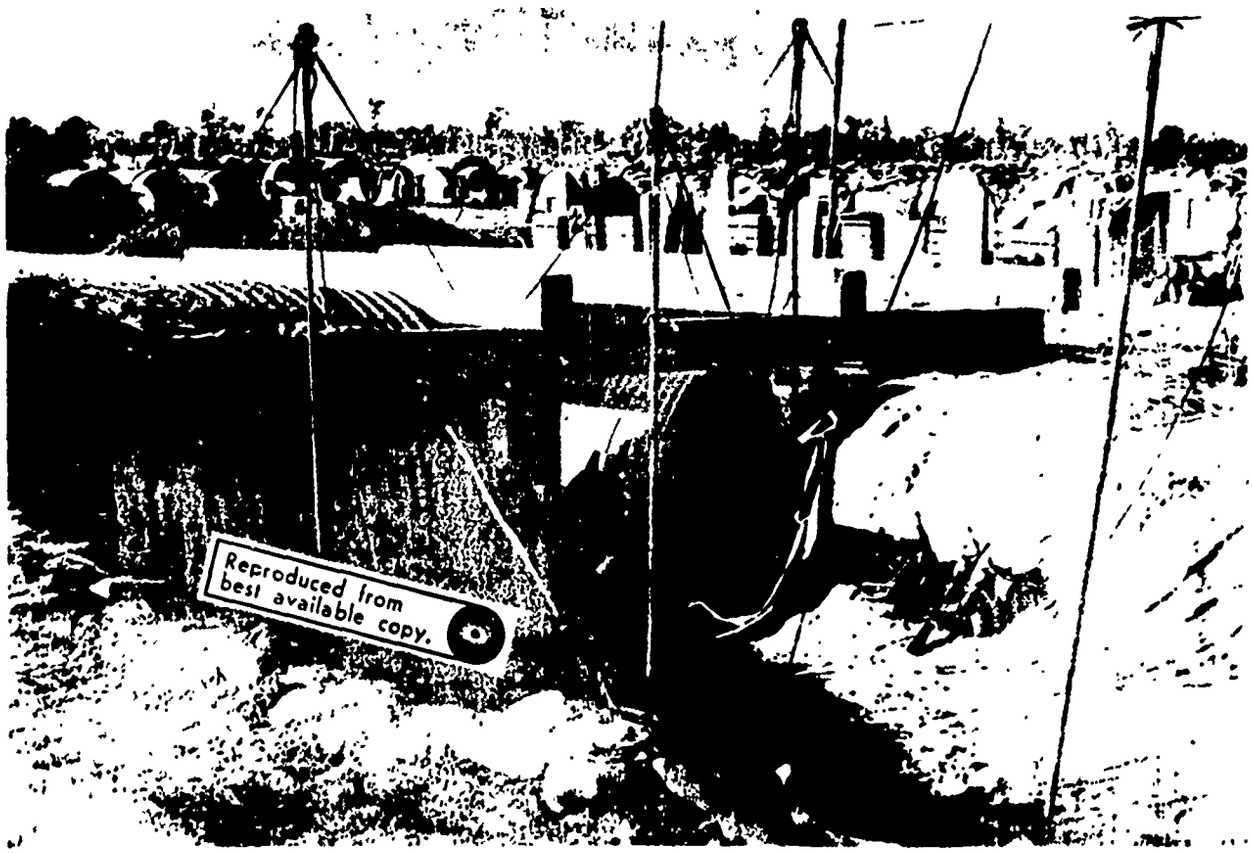


A Combination Underground Perimeter Bunker and Observation Post.

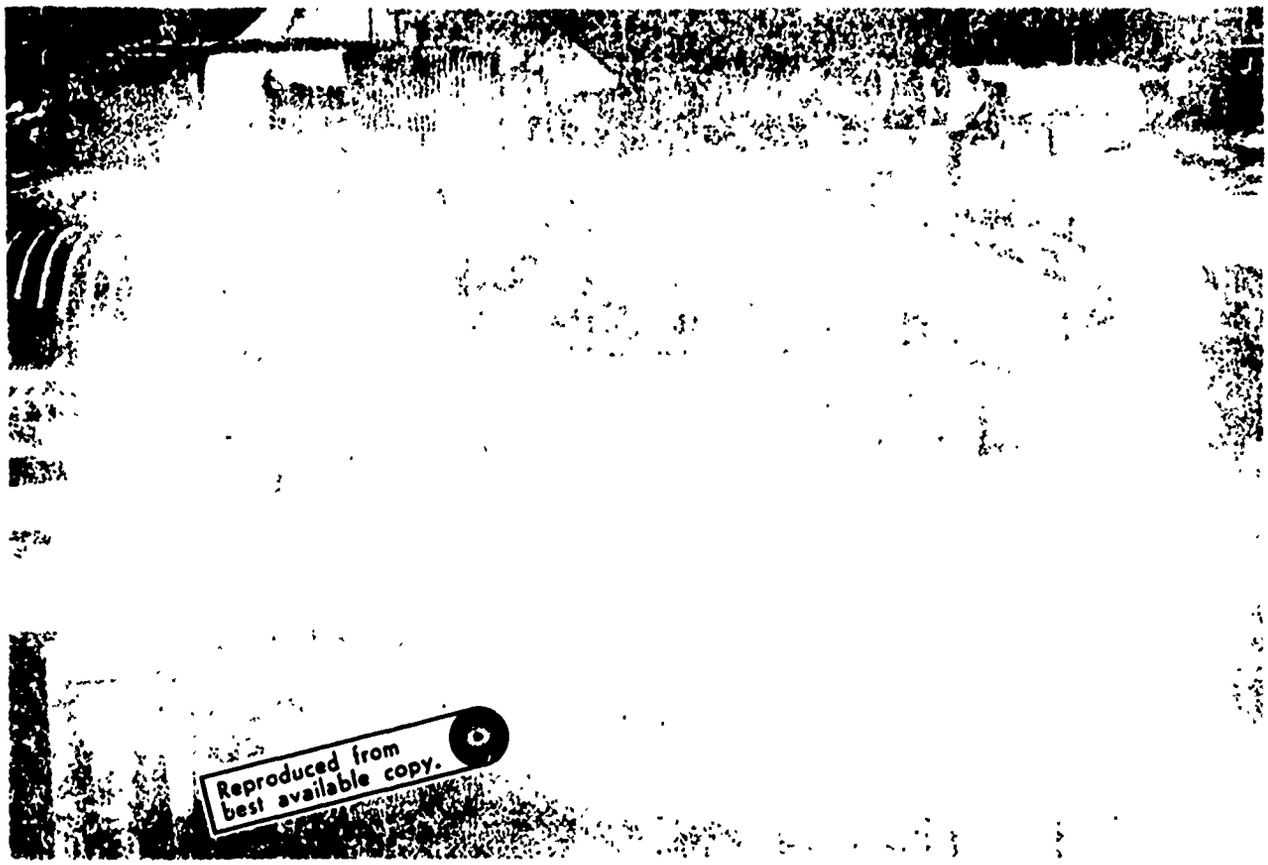




...ng runway matting and three layers
...ts bunkers.

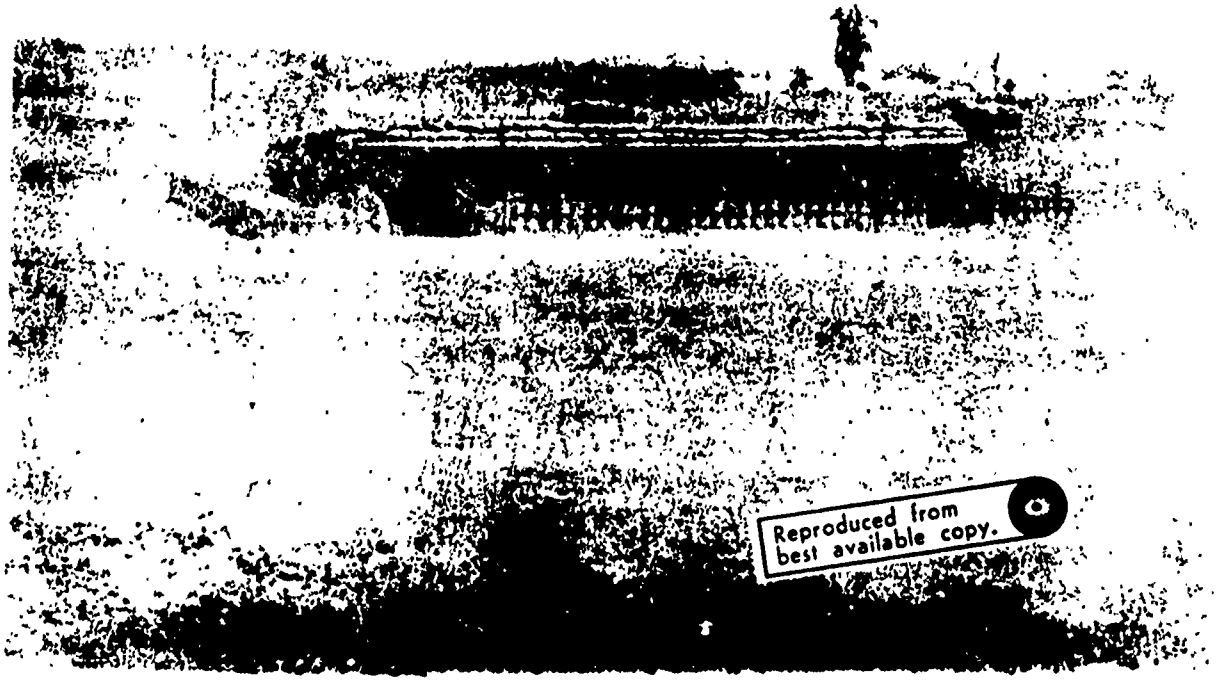


...exas culvert (note pierson ...
... construction.

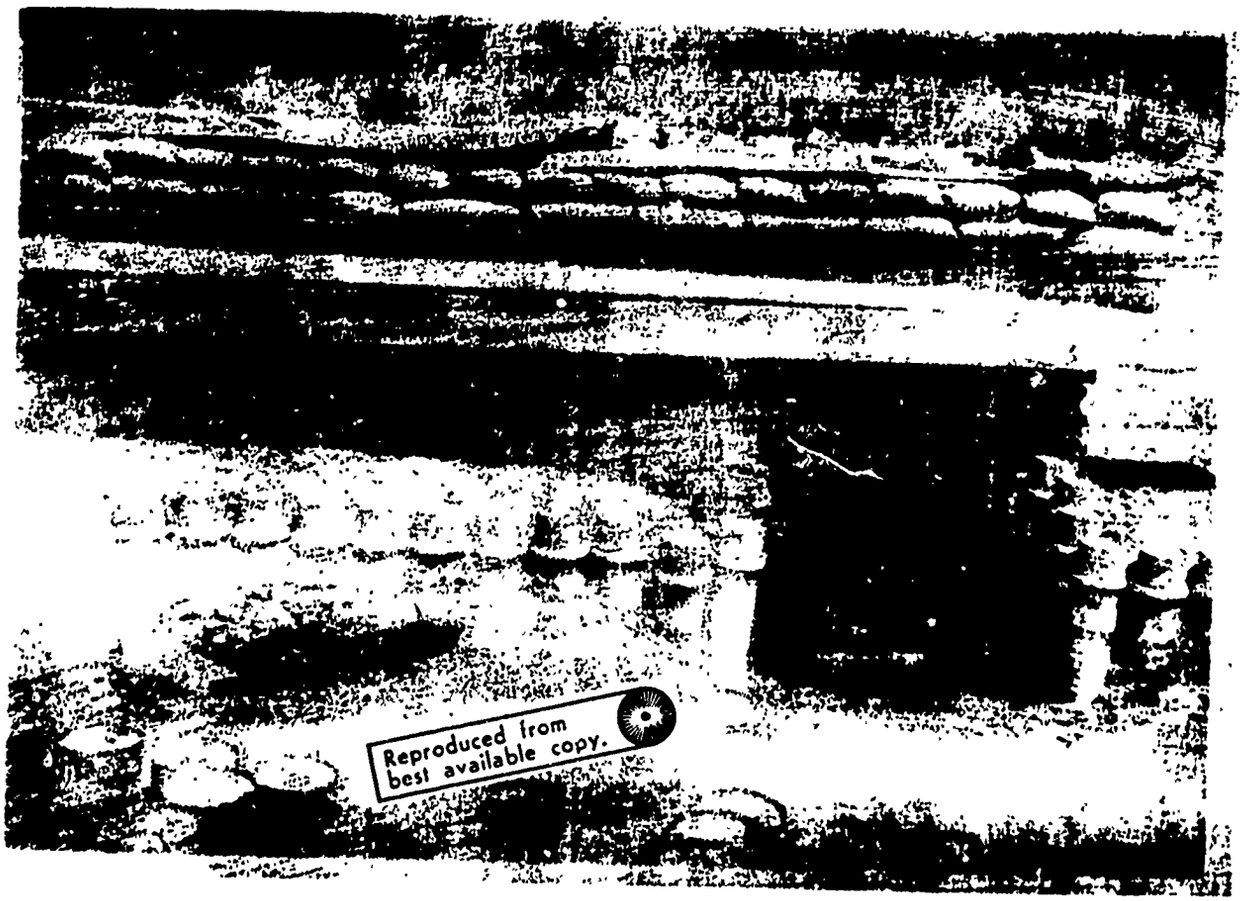


TOC under construction. Steel conexes also used in construction.

98

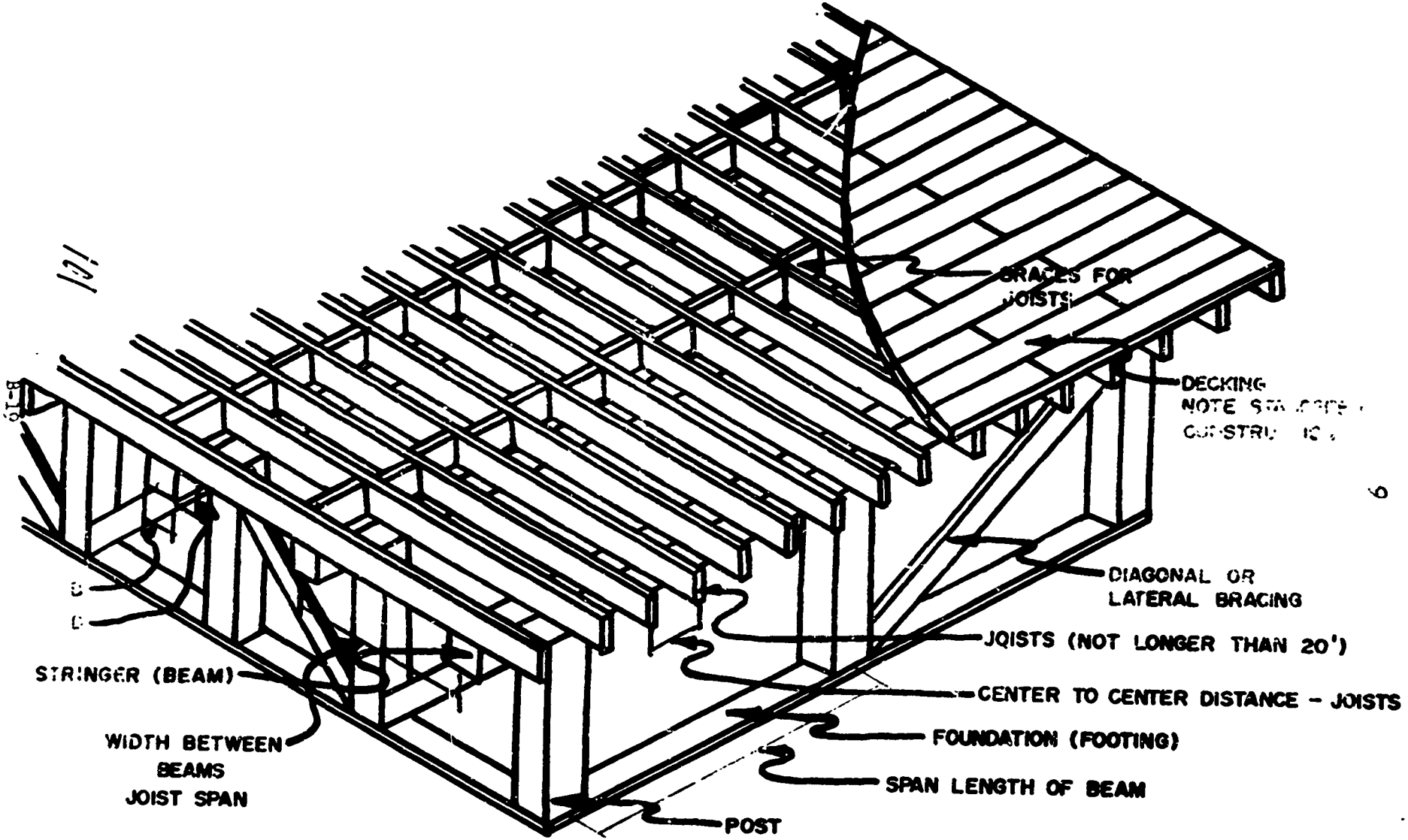


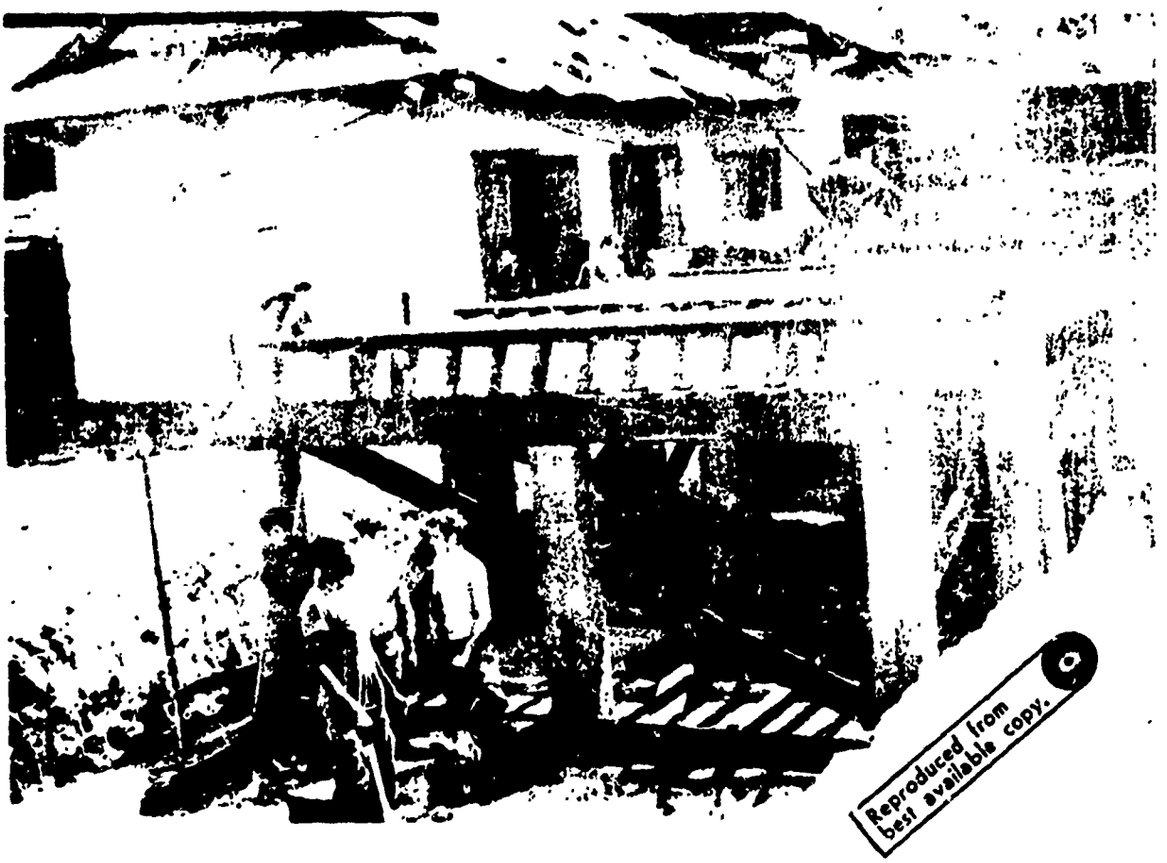
Ammunition Supply Point.



Squad-Size Sleeping Bunker.

TYPICAL BUNKER (Isometric View)

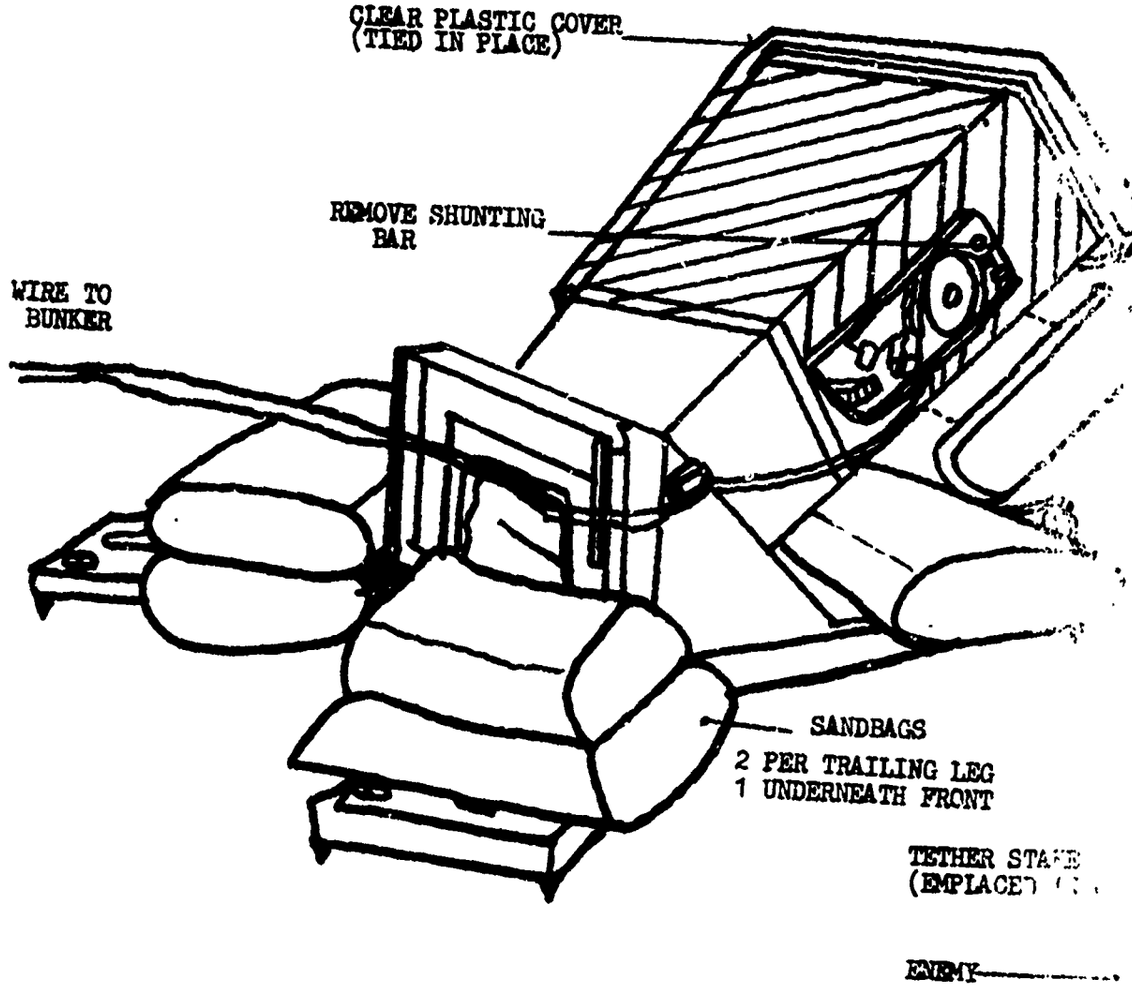




Typical Bunker Under Construction.

ANNEX C

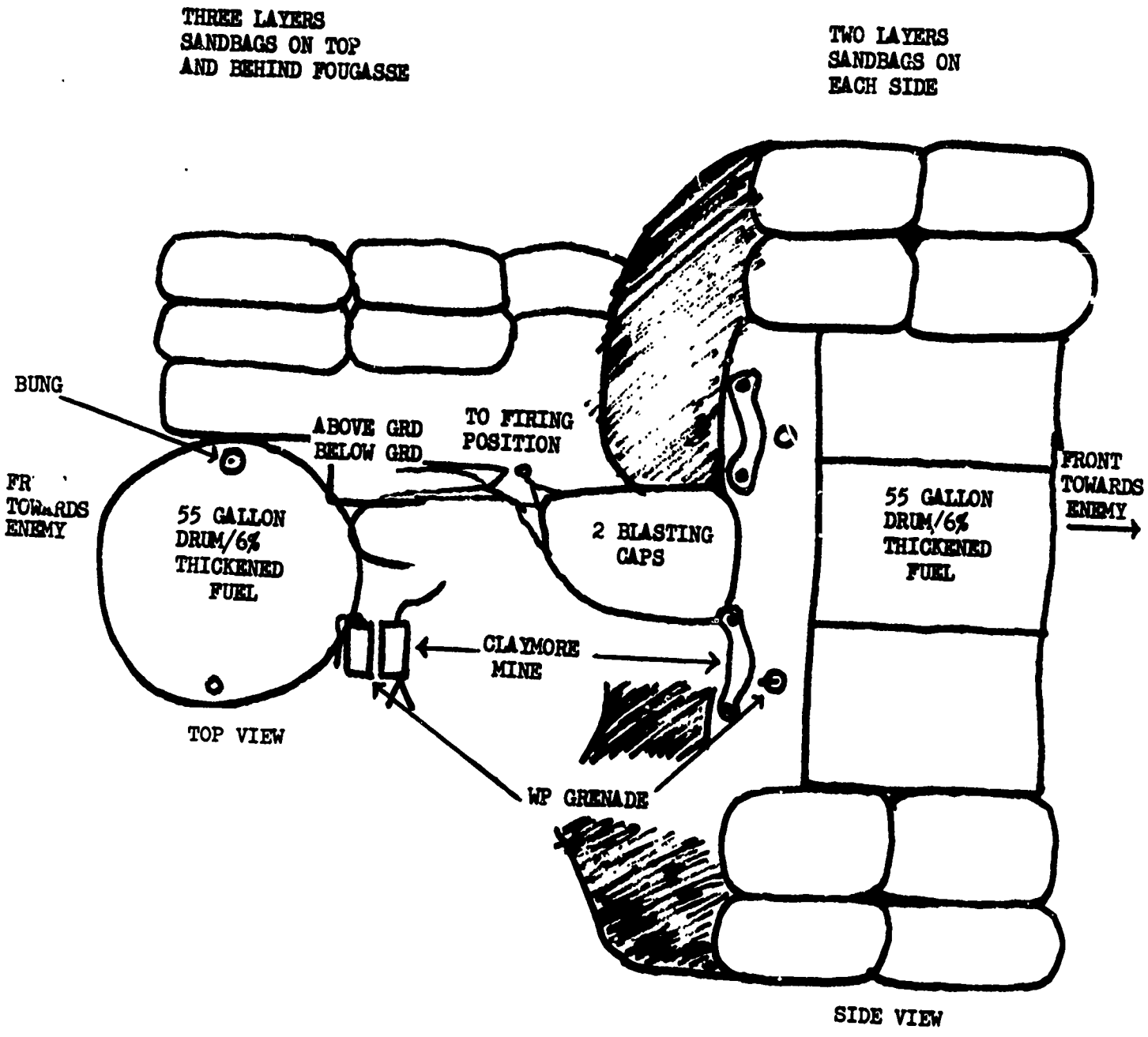
CHEMICAL MUNITIONS



M3 CS Launcher, 35mm Cartridges, Tactical CS

The M3 CS launcher is a portable, expendable launcher weighing 34 pounds, which is capable of being employed by one man to provide a rapid buildup of non-persistent CS on a target. The elevation of the launcher may be adjusted to fire point-blank of to engage a target up to 250 meters. At this range the CS cloud is elliptical in shape, 40m wide by 175m long. Expended launchers must be retrieved or destroyed after firing to prevent enemy use.

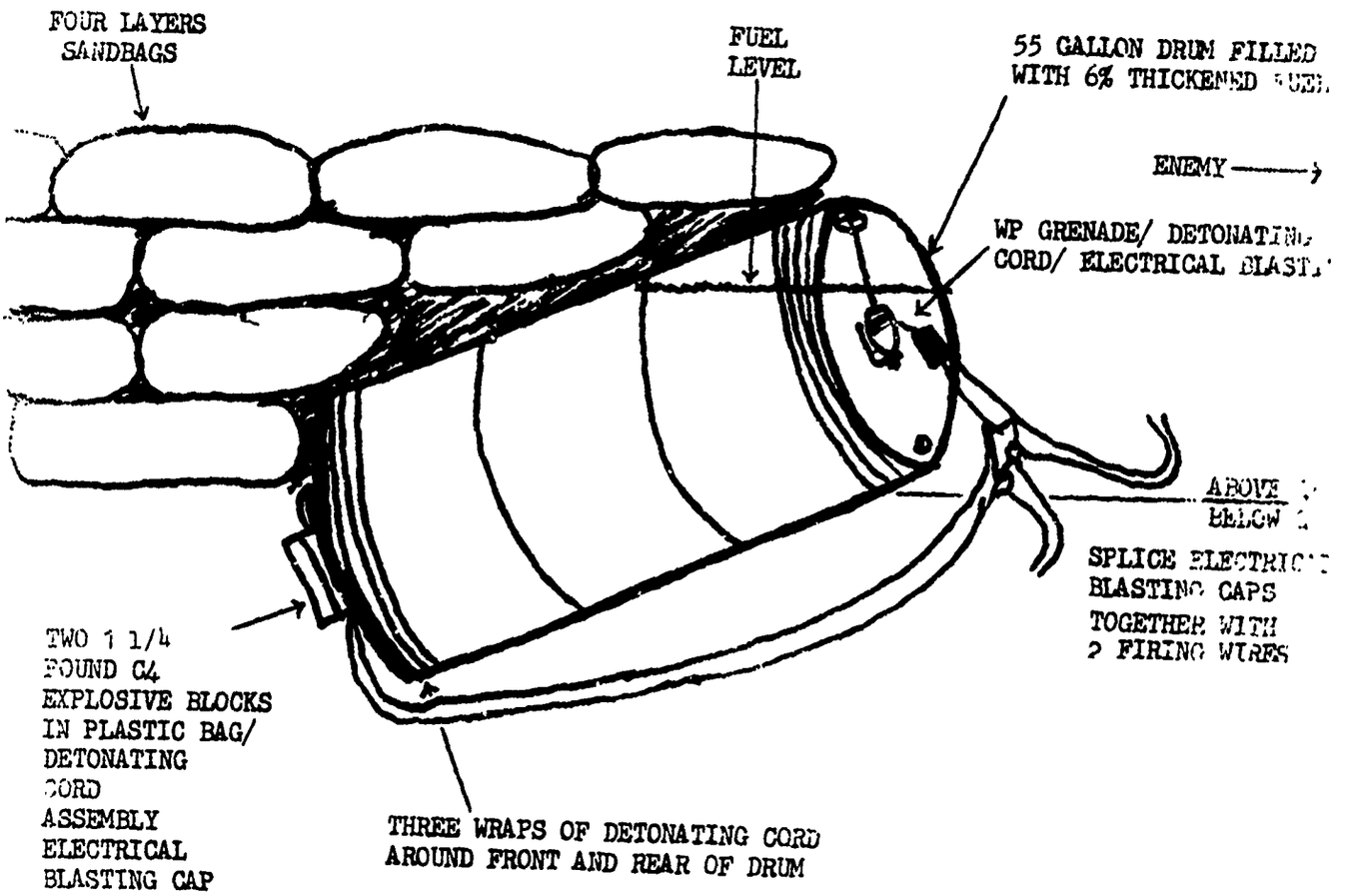
104



Non-directional Fougasse

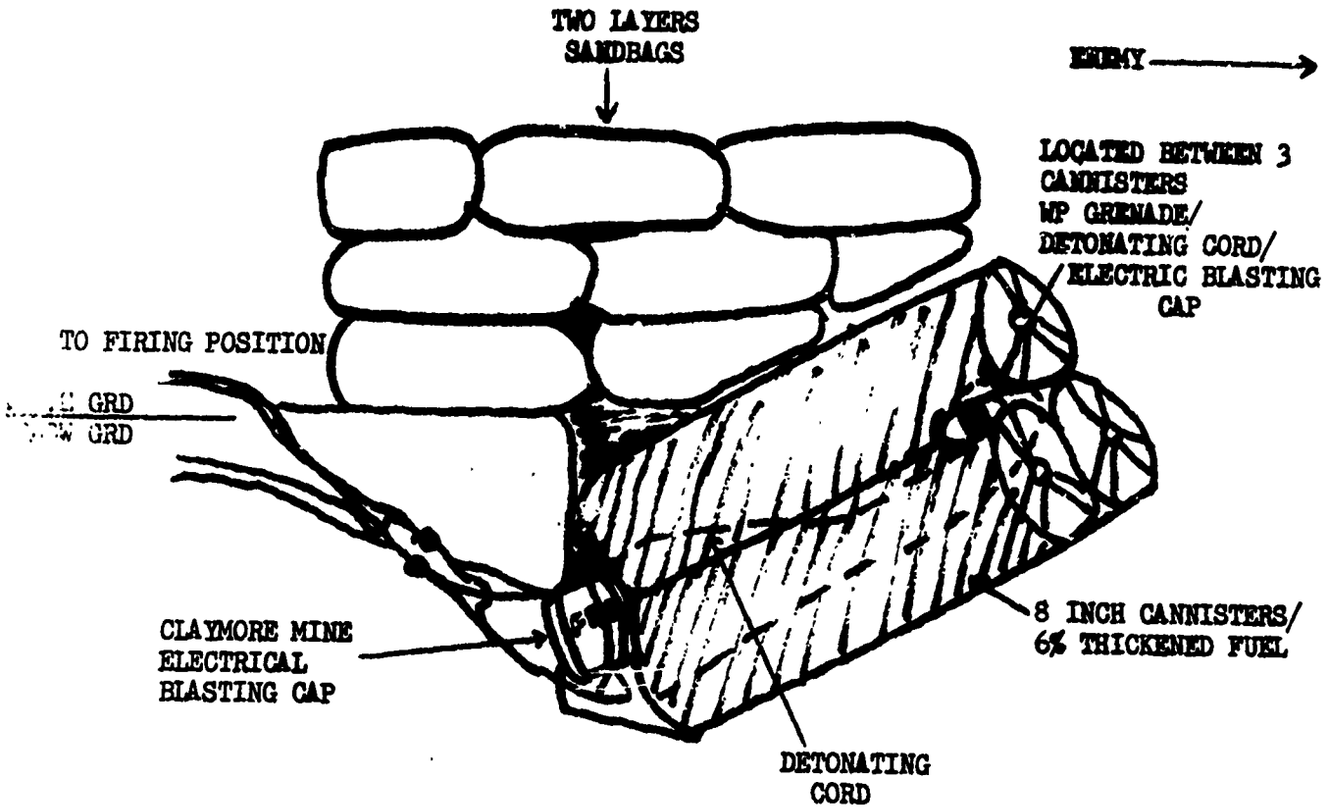
Two claymores are placed to the rear of the fougasse with one WP grenade taped to the front of each claymore. The fougasse is double-primed electrically with at least one wire buried and tamped with 2 layers of sandbags on each side, three layers of sandbags on the top, and three layers of sandbags immediately behind the fougasse to preclude blowback on friendly positions.

105



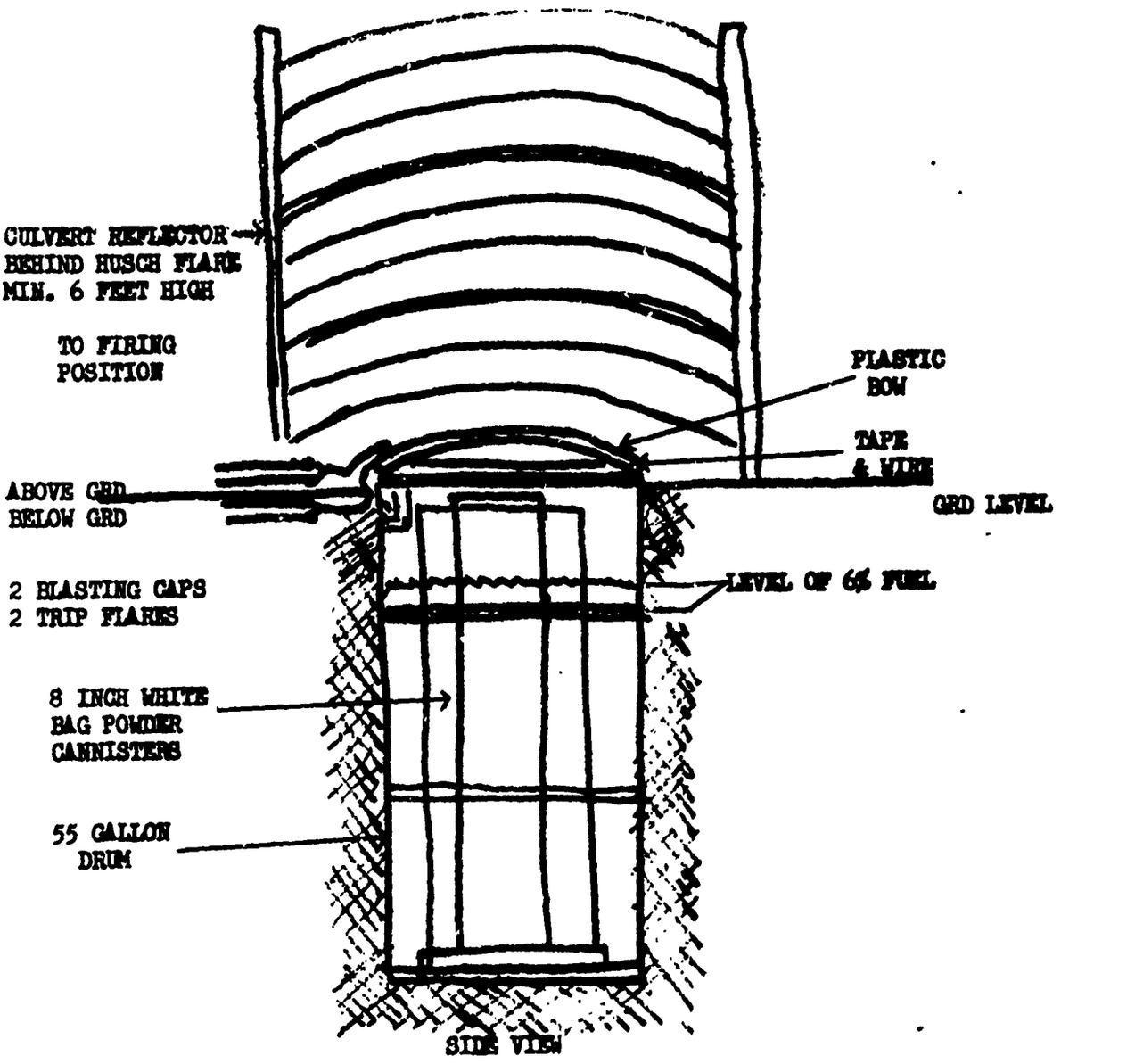
Directional Fougasse

Two 1 1/4 pound blocks of C-4 are placed at the rear of the drum to project the fuel. Three turns of detonating cord are wrapped around the rear and the front of the drum to cut both ends of the drum upon ignition. Insure that the detonating cord does not cross itself at any time and that it is taped in place. To ignite the fuel, place a WP grenade with three wraps of detonating cord on the front of the drum. Use one solid length of detonating cord for the entire system. The fougasse is primed electrically with at least one wire buried. The fougasse is tamped with at least 40 sandbags (four layers) to preclude blowback on friendly positions. Two claymores may be used in lieu of C-4.



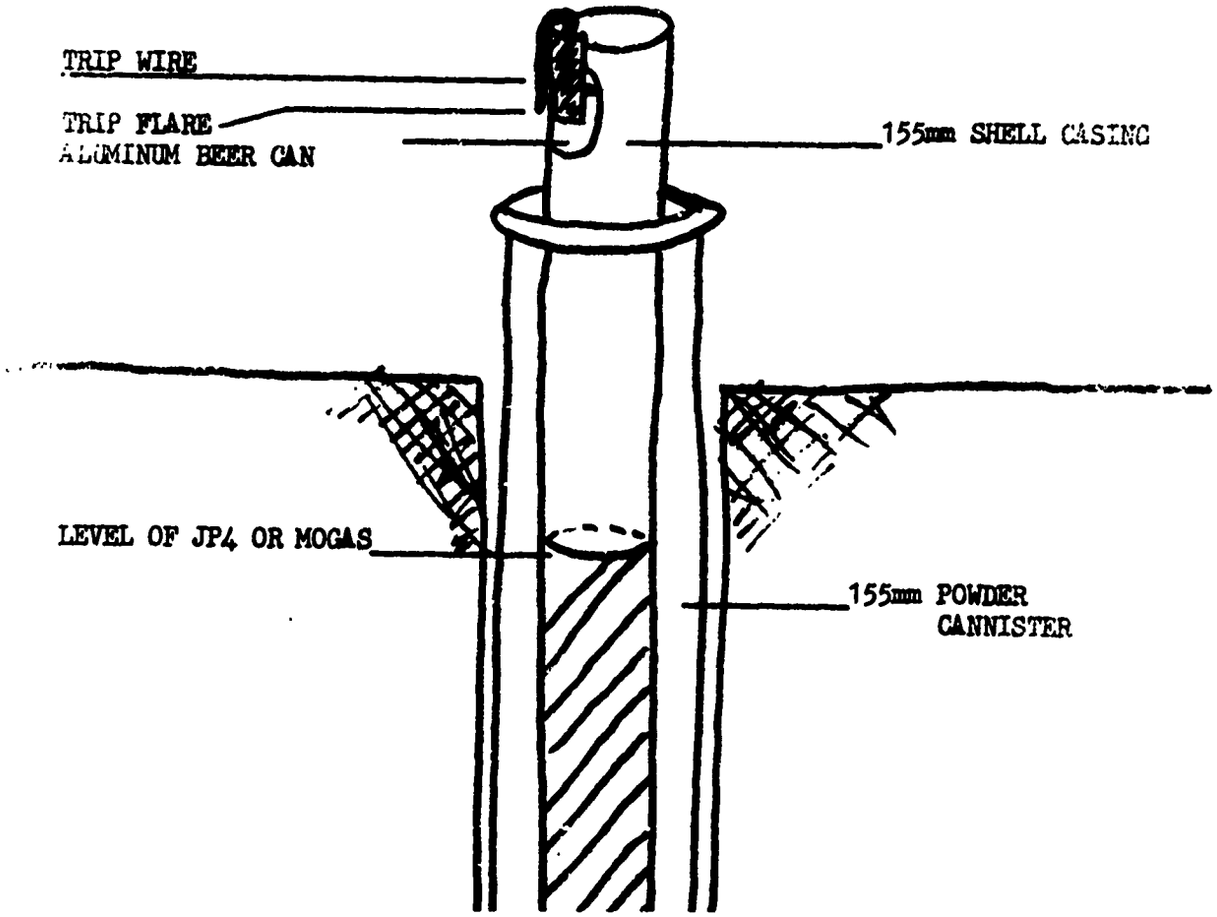
8-inch Cannister Fougasse

One claymore mine is placed to the rear of the cannisters to project the fuel. An electrical blasting cap is placed in the well of the claymore for detonation. One WP grenade with three wraps of detonating cord is placed between the three cannisters close to the front. One free end of the detonating cord is then wrapped three times around the claymore mine and an electrical blasting cap is taped to the end for the purpose of double priming, and the other free end is then placed in the second firing well of the claymore mine. The lids of the cannisters should have unbroken rubber gaskets and be tightened prior to emplacing the fougasse. Tamp the fougasse with loose dirt and 25 (two layers) sandbags on top. The fougasse is double-primed electrically with at least one wire buried.



Husch Flare

Three 8-inch white bag powder cannisters with a 3/16-inch hole drilled in the bottom center of each are filled 3/4 full with 6% thickened fuel. The lids, with rubber gaskets, are replaced and are firmly fastened. The cannisters are turned upside down and are placed in a 55-gallon drum which has one end cut out. The drum is filled 2/3 full with 6% thickened fuel. Two blasting caps and two trip flares are rigged to the top of the drum for ignition of the fuel. A plastic cover with a convex bow is placed over the top of the 55-gallon drum to keep out rain and to prevent the fuel from deteriorating. Upon ignition, thickened fuel in the 8-inch cannisters will be vaporized and expelled as a burning jet of flame through the hole in the cannister. A culvert reflector is placed behind the husch flare to provide directional illumination. The husch flare will provide a 2- to 3-meter high jet flame for 7 to 9 hours.



ARA Marker

ARA markers are employed at night, in the event of an enemy ground attack, to assist supporting Cobra helicopters in determing the location of friendly troops. A 155mm powder cannister is 2/3 buried in the ground. A 155mm shell casing is placed inside the powder cannister and is filled half full with JP4 or Mogas. An aluminum beer can with the top removed is wired on the inside of the shell casing approximately 3 inches from the top. A trip flare is then hung by the spoon on the side of the shell casing, with the bottom of the trip flare inside the top of the beer can. The trip wire is then laid from the flare to the fighting position. A small piece of clear plastic is tied over the top of the shell casing to prevent rain from mixing with the fuel. The ARA marker is ignited by pulling the trip wire from the fighting position. Once the spoon is released, the trip flare falls into the beer can and becomes fully ignited. The trip flare melts through the aluminum can in 12 to 16 seconds and falls into the bottom of the shell casing to ignite the fuel. The ARA marker will provide adequate illumination for 1 1/2 to 2 hours.

ANNEX D

PROTECTIVE BARRIER THICKNESS TABLES

The following tables may be used for planning purposes in providing overhead cover for bunker construction:

WEAPON: Up to 82mm Mortar All Ranges Considered

ESTIMATED BARRIER THICKNESS REQUIRED IN FEET

Material	Fuzing	
	SQ	.05 Sec Delay
Wet Clay	5.0	12.0
Dry Clay	5.0	12.0
Wet Sand	2.5	7.0
Dry Sand	2.5	6.0
Reinforced Concrete	1.2	3.0

* *

WEAPON: Up to 155 mm Howitzer Minimum Range: 9000 Meters

ESTIMATED BARRIER THICKNESS REQUIRED IN FEET

Material	Fuzing	
	SQ	.05 Sec Delay
Wet Clay	6.5	28.0
Dry Clay	6.5	25.0
Wet Sand	4.5	21.0
Dry Sand	3.5	18.0
Reinforced Concrete	3.0	8.0

* *

WEAPON: Up to 140mm Rocket Minimum Range: 2000 Meters

ESTIMATED BARRIER THICKNESS REQUIRED IN FEET

Material	Fuzing	
	SQ	.05 Sec Delay
Wet Clay	5.5	23.0
Dry Clay	5.5	21.0
Wet Sand	4.0	16.5
Dry Sand	3.0	14.5
Reinforced Concrete	2.5	6.5

WEAPON: Rocket Propelled Grenade All Ranges Considered

ESTIMATED BARRIER THICKNESS REQUIRED IN FEET

Material	Fuzing	
	SQ	Dud
Wet Clay	11.0	7.0
Dry Clay	11.0	7.0
Wet Sand	11.0	3.5
Dry Sand	11.0	3.5
Reinforced Concrete	5.5	1.0

*** *** *** *** *** *** ***

Note that the required barrier thicknesses are estimates only. Exact requirements may be requested from the US Army Ballistic Research Laboratories. Any request should include type of barrier materials to be utilized in construction in specifics, e.g. type and thickness of timber, type soil, or type and thickness of steel plate or planking.

///

ANNEX E

BIBLIOGRAPHY

BIBLIOGRAPHY

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FM 6-20-2 Field Artillery Techniques

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113

ANNEX F

GLOSSARY

ANNEX F

GLOSSARY

Barbed Wire Concertina - commercially manufactured barbed wire made of a roll of single-strand high-strength, spring steel wire with 4-point barbs attached at 5cm spacing. Wire forming coils are clipped together at intervals so that the concertina opens to a cylindrical shape 15 meters long and 90 centimeters in diameter. Barbed tape concertina is in a diameter of 85cm and expands to a length of 15 meters.

Beehive - a direct-fire artillery round containing 9,000 fleshettes, using a timed fusing, in an anti-personnel role.

Berm - Army usage of the term refers to an earthen mound pushed up around a defensive position to provide cover for incoming weapons fire.

Bunker Kit - a prefabricated kit containing the necessary precut materials to rapidly construct protective shelters at a fire support base. The kit normally is airlifted by helicopter, but may be delivered by other means.

Claymore Mine - an electrically detonated anti-personnel mine utilized in the defense of a friendly position (M18A1).

Fire Cracker - common name given to the improved conventional ammunition (ICM). A base ejecting projectile releasing a number of bomblets for fragmentation. Used as an anti-personnel device in 105, 155 and 8-inch artillery rounds.

Flame Mine - constructed using the same materials as fougasse. Should be emplaced parallel and between the second and third rows of defensive wire and sandbagged behind to provide a forward bursting radius of 30 to 50 meters.

Fougasse - a directional flame field expedient. It consists of a 55-gallon drum of thickened fuel, partially embedded in the ground and covered with sandbags. It is rigged with explosives and fired electrically. It should be emplaced immediately inside the final protective wire and aimed along the wire with a slight upward angle. When detonated, it will provide a fan of flame covering a 60-degree spread to a range of 60 meters.

Husch Flare - a flame field expedient capable of providing illumination for four to eight hours to a distance of 100 meters, 180 degrees forward of the flame. It usually consists of three 175mm powder cannisters in a 55-gallon drum of

thickened fuel and a reflective assembly made from 24-inch culvert. It is electrically fired, reusable and should be emplaced so that it is easily accessible from within the fire base to facilitate maintenance and refilling. Light from the flare will free artillery to fire defensive targets rather than illumination in the event of attack.

Killer Junior - a standard high-explosive round with a mechanical time fuze. Used in anti-personnel role with the 105 and 155mm artillery rounds.

RPG Screen - common name given 9-gauge chain link fencing. It is used in connection with bunker and perimeter construction at a stand-off distance of two to five feet to deter rocket-propelled grenades (Soview RPG-2 and RPG-7).

Sapper - a well trained Viet Cong or North Vietnamese soldier capable of breaching most defenses employed in Vietnam. The attack is characterized by a thorough reconnaissance, a concentrated indirect fire attack, during which an entrance to the base is gained and direct fire by grenade, RPG, and satchel charges are used, to sound the same as indirect fire in order to keep the defenders pinned down for as long a time as possible.

Texas Culvert - multi-plate personnel arch. A flat-bottomed, oval culvert 8 feet high in 12-foot lengths. It is approximately 3/8-inch thick sell and is assembled from five pieces with 1/2-inch bolts. Utilized in bunker construction.

ANNEX G

EXAMPLE OF SAPPER OPERATIONS

EXAMPLE OF SAPPER OPERATIONS

(ABSTRACTED FROM USARV OPERATIONS REPORT-LESSONS LEARNED, 1971)

The most frequently used sapper tactic is the raid. Two phases are employed for this operation: the reconnaissance and the attack. Both are executed with meticulous care, requiring considerable time.

a. As soon as the objective is announced, the sapper force commander begins his planning and assigns tasks to his subordinate leaders. One of these responsibilities is a detailed reconnaissance. From three to seven days are usually spent reconnoitering the objective, although larger and more difficult objectives may require several weeks. All terrain features are analyzed. Avenues of approach and withdrawal are determined. Listening posts and other security measures are located and carefully studied for patterns which might be exploited. Particular attention is given to the alertness of defending forces. An effort is made to approach as close to the objective as possible, even to the extent of penetrating the perimeter and infiltrating indigenous labor forces that work at or near the objective. Friendly anti-intrusion devices are located and protective wire is studied to determine how it may best be breached and how long it will take to do so. A pattern of wire, mines and trip flares in the vicinity of the perimeter is expected. If a flare is discovered or tripped hundreds of meters from the objective, the sapper will use even more time and exercise even more caution than he usually does. The enemy strength around the perimeter and in each objective area is determined, including supplementary barriers, trenches, bunkers, crew-served weapons, command posts, ammunition storage and reinforcement routes. Based on this reconnaissance, fire support plans for the attack are developed.

b. The violence and speed that characterize a sapper attack are the culmination of methodical planning and preparation. Prior to the attack all personnel are briefed in detail and rehearsed on their tasks. Frequently an entire day is spent approaching to within a few hundred meters of a perimeter. Most of the hours of darkness are consumed in proceeding the last few hundred meters to the wire. The least likely and most difficult avenues of approach are used if reconnaissance has revealed that these are unguarded. Success in the attack is dependent upon being able to breach the perimeter undetected. The assault

is violent and invariably from more than one direction. It begins with a preparation, usually mortar and RPG fires. It is anticipated that the defenders will follow the usual practice of seeking shelter within the bunkers. Once the defending force has retreated to the bunkers, RPG fire is placed on bunker apertures at the points of penetration. Small arms are not employed, except to cover the withdrawal, in order to avoid disclosing the location of attacking forces. Once defending troops are forced into the bunkers, penetration of the perimeter is effected. Mortars cease firing, but the illusion of incoming fire is maintained through the use of RPG's, grenades and satchel charges. Once inside the perimeter, each cell moves to its objective. Their move through the objective area is made quickly, without consideration for personal safety. After completion of the destruction mission the cells move to the withdrawal points, throwing grenades and satchel charges into bunkers en route. Once clear of the perimeter the cells follow a prescribed withdrawal route to a predesignated assembly point. Every attempt is made to carry the dead and wounded with the withdrawing force, although if they are pursued, they may attempt to hide the dead and more seriously wounded where they can later be retrieved.

c. In a typical raid the enemy unit was divided into four groups, each consisting of four cells of four men each. By dusk of the day prior to the attack, the 16 teams had deployed around the objective area and concealed themselves in underbrush within 100 meters of the perimeter wire. They were not detected during this eight hour period. Then followed the standard pattern of mortar and RPG preparatory fires while the wire was being breached. In this particular instance, the defenders called in defensive fires from all positions, adding to the noise. Visibility was restricted by a thick blanket of fog. Defending forces, suspecting an attack by fire, had occupied defensive positions within bunkers. When the enemy mortar fire ceased, the combination of friendly protective fire and enemy RPG fire continued. This left the impression that the attack by fire was still taking place, when, in fact, the sappers had penetrated the perimeter and had begun to destroy bunkers and artillery pieces. The defending force, finally recognizing that a penetration had been made, left their bunkers and engaged in hand-to-hand combat, but not before two artillery pieces and a number of occupied bunkers had been destroyed. Although the friendly position was not entirely overrun, casualties were high, and the enemy achieved a psychological victory at a time when he was seeking publicity.

ANNEX H

EXAMPLE OF AN ACTION AGAINST A US BASE

EXAMPLE OF AN ACTION AGAINST A US FIRE SUPPORT BASE IN 1970
(Names and places have been deleted for security reasons)...

"The following recap of the action at FSB ***** is submitted as a back-up to our discussion in the 1st Brigade area t this morning."

"The attack on FSB ***** was anticipated by the base commander. He had one company positioned to the southeast and elements of another company on FSB ***** to the south. On the fire base, the men also were ready for an attack and were well dug-in and bunkered, extra ammunition was kept ready and fire plans had been well conceived and practiced. The base was supported by cannon artillery at FSB's ***** and ***** and the Special Forces camp at *****. In all, 27 tubes, ranging from 105 to 175mm, were ready to fire. Throughout the early evening, preemptive fires worked over the woodline around the base at irregular intervals. All weapons were test fired, the guard posted, and the night began."

"A very brief interrogation of three PW's captured after the attack has identified attacking forces as the 95C Regiment, possibly the 2d Battalion. Elements of the unit, supported by the heavy weapons company and probably the 9th Division's artillery battalion, had initially occupied an attack position about a two hour's walk from the fire support base and were probably trying to get into their attack positions at about this time."

"The first enemy fire came at 2143 hours. During the next ten minutes about 100 rounds impacted inside and outside the perimeter. It came as no surprise to the men of the base; however, it was heavier than they expected. While 60mm and 82mm mortars, 57mm recoiless rockets, 107mm, B-20 and B-40 fire fell about them, they put their well-rehearsed plans into effect. Organic weapons and artillery on the fire base began to pour out a steady stream of fire. Brigade headquarters was notified and supporting artillery began firing immediately on suspected firing sites. Simultaneously, aerial rocket artillery lifted off and was overhead in minutes and was accompanied by flareships, Nighthawk, tactical air and Shadow. This massed fire support was closely coordinated by the commander and shifted as necessary as the fight went on. On the base itself, the 81mm mortar platoon added to the volume of fire. In those early minutes a freak enemy round hit on one of our mortar positions, killing three of the crew as they served the weapon. Another round scored a direct hit on one of the perimeter bunkers, killing three of the defenders.

"From four positions around the firebase the enemy employed .51 caliber machineguns in an air role. Our aircraft responded, destroying three of the guns. One of our flare aircraft was hit and made an emergency landing on the firebase. While exiting the aircraft under heavy fire, the pilot was struck by the main rotor blade and died as a result.

"The expected ground probes came from the southeast and northeast and were met by heavy fire from the bunkers. Simultaneously, direct fire, artillery and supporting aircraft contributed more firepower. The attackers faltered and not a man reached the berm.

"By 2300 hours all incoming had ceased, although sporadic small arms fire continued from snipers in trees around the base until they were silenced. Supporting fires then shifted to probable routes of withdrawal.

"During all of this the recon platoon from Echo Company manned FSB ***** some two kilometers to the south. They heard and saw the fight going on, and at 0035 hours they observed a large force, possibly battalion size, moving past their position to the south. They immediately began to adjust ARA and a Shadow section onto the target, probably the withdrawing attackers. Although they were unable to assess the enemy's losses because of darkness, the platoon knew the fire was right on the money.

"By 0230 hours all enemy fires ceased. We continued to pound his routes of withdrawal and the Cav made plans for the morning's sweep, which began at first light.

"Our Air Cavalry Squadron was on station before dawn and began intensive reconnaissance to the west and south. Throughout the morning they killed seven as the enemy retreated to the southwest. Around the firebase the sweeping platoon found fifty bodies and captured three badly wounded PW's. They were evacuated immediately, but on the way to medical care the PW's identified their unit as the 2d Battalion, 95C Regiment. The equipment losses were significant in themselves and tell a story of disorganized retreat. In addition to the three .51 caliber machineguns destroyed, so far we have found seventeen AK-47 rifles, four RPD light machineguns, one RPG-2 rocket launcher, one 60mm mortar complete except for the sight, twenty-five 60mm mortar rounds, twenty B-40 rounds, ten bangalore torpedoes, ten 57mm rounds, 100 Chicom grenades, five Chicom Claymore mines, two packs, eight shovels, 5000 rounds of AK-47 ammunition and numerous items of personal equipment, and documents which identify the 95C Regiment.

"Once again, we and the 95C Regiment have clashed and his defeats continue. Our present operations are denying him the rest he so desperately needs. He has been in steady contact since November - even in his haven along the west [illegible]. I am convinced that the attacks on our fire bases are part of the 9th VC Division's desperate reaction to our relentless pressure. We will continue to bear down on these [illegible] units."

ANNEX J

ENVIRONMENT OF RVN

ANNEX J

ENVIRONMENT OF RVN

The Geomorphic Regions (see Figure J-1)

a. The Mekong Delta. The Mekong Delta begins southwest of Saigon and continues southwesterly to the Gulf of Siam. It is a flat feature which is inundated during most of the year. The average elevation of the delta do not vary over a meter for tens of miles. Most of the sediments in the delta are very fine-grained sandy silts, which are waterlogged for most of the year. The waterlogging effect causes the soils of this region to be more plastic in their behavior. The amount of sediment being carried by the Mekong River is very low, and the southwesterly current, which flows along the seaward margin of South Vietnam, removes sediment from the mouth of the delta and transports it southwesterly in the direction of the Gulf of Siam. The majority of the land in the Mekong Delta is, or has been, under cultivation, and the major crop is rice. Two exceptional areas are the U-Minh Forest and the Plain of Reeds. The U-Minh Forest is an almost impenetrable swamp of mangrove and similar types of vegetation. The Plain of Reeds is a perennially wet marsh area which is inundated 1 to 5 feet during the wet season.

b. The Mekong Terrace. This region is bounded on the southwest by an arbitrary line passing just southwest of Tay Ninh, Saigon and Vung Tau, and on the northeast the terrace is bounded by the western slope of the Southern Annamite Mountains. The terrace is generally characterized by undulating topography which grades into rolling hills near the Annmite Mountains. There are several large river valleys which are extensively planted with rice throughout the terrace. The most notable are the Song Dong Ngai and the Song Saigon. The remainder of the terrace region is characterized by soils which are coarse-grained and well drained in nature during portions of the year. Throughout most portions of the terrace, laterite occurs at, or within a few meters of, the surface of the ground. The terrace region is partitioned by different types of vegetation, which are the main limiting factors in the movement of men and vehicles through this geomorphic province. The southern portions of the Mekong Terrace are generally composed of rice paddy lands which are well drained during the dry portions of the year. The most northern portions of the area are characterized by thick broadleaf evergreen forest. The northeastern portions of the area are covered by secondary forest, and near the western slope of the Southern Annamite Mountains multicanopied forest are dominant.

c. The Southeastern Coastlands. The Southeastern Coastlands are bounded on the north by the Southern Highlands, on the south and east by the South China Sea and on the west by the Mekong Terrace. This coastal area is exptemely dry for most of the year and windblown sand has formed extensive dunes inland from the beaches. Between Phan Thiet and Phan Rang the arid region is best developed and little or no vegetation exists on the dunes and surrounding hills. From Phan Rang to Vung Ro the rugged granite mountains abruptly meet the sea, forming tombolos, sea stacks, and

associated seacost features. These rugged mountains tend to cut off the beach lines in many localities and locally restrict movement to narrow roads. The sand is extremely uniform, thus it presents a great problem to wheeled vehicles but does not restrict tracked vehicles. Between each series of dunes there is commonly a marshy area, which severely limits traffic of vehicles. These marshy areas restrict movement in directions perpendicular to the coastline. The mountainous areas near the beach are often forested with scrub or brush. The steep, rugged granitic hills have weathered extensively to boulder-covered slopes which are generally impassable to all vehicles.

d. The Southern Highlands. The Southern Highlands area is bounded by the Northern Highlands, on the east by the Northeastern Coastlands, on the south by the Mekong Terrace and the Western Plateaus. Near Dalat and the surrounding area, high level savannas are commonly found. The Bao Loc Plateau is a concave feature which is composed of basalt and has no apparent external drainage. The plateau and the regions near Dalat are often heavily forested with two and three-needle pines. The mountains in this region are made up mainly of hard indigenious rocks which have steep slopes, sharp crests and narrow valleys. The mountainous slopes have weathered extensively, producing boulder-covered slopes which are prohibitive even to foot traffic. Most of the peaks in this area range from 1000 meters to 2500 meters above sea level. This region is unsuitable for armored operations.

e. The Western Plateau. This region is an elevated region of rolling to undulating topography with predominately savanna-type vegetation. The plateaus are bounded on the north and east by the Northern and Southern Highlands, on the south by the Southern Highlands and on the west by Cambodia. This region is suitable for most vehicular movement at most times during the year; however, during the period June through September, the region receives much rainfall without any periods of drying, and the soils, which are silty clays, are unsuitable for excessive vehicular traffic. In many of the valleys which separate basalt-flow edges, the local residents grow rice, and this may prohibit vehicular movement at right angles to the flows. This region is the most suitable for moderate-sized operations with tracked armor.

f. The Northern Highlands. The Northern Highlands extend from Tuy Hoa north to the DMZ area and are bounded on the east by the Northeastern Coastlands, on the south by the Southern Highlands and Western Plateaus, and by Cambodia on the west. This geomorphic province is not very different from its southern counterpart, as the mountains in this region are mainly made up of hard igneous or matamorphic rocks which present steep slopes, sharp crests, and narrow valleys. The mountainous slopes have weathered extensively to boulder-covered landscapes which support some of the most dense vegetation in South Vietnam. The basic difference between the two highland provinces is the amount of rainfall received. The northern area receives almost twice as much rainfall as the southern provinces and the vegetation is correspondingly better developed in the northern area. The region is generally unsuitable for armored operations.

g. The Northeastern Coastlands. This area extends from Vung Ro to the DMZ and is bounded on the east by the South China Sea and on the west by the Northern and Southern Highlands. These Coastal areas are much wetter during most of the year than their southern counterpart and the area near Hue is one of the wettest parts of the country. The Northeastern Coastlands are much greater in width and in several areas have been widened by the deltas of the inland rivers. Near both Qui Nhon and Tuy Hoa the inland rivers have considerably widened the coast. These minor deltas of the inland rivers are saturated for most of the year and mostly rice is grown in these areas. The areas are unsuitable for movement of vehicles in the wet seasons, but can prove trafficable in the dry seasons. North of Qui Nhon, the beach areas and coastal regions take on a distinctively different character due to the high rainfall received in these coastal regions. The number of waterways and rivers is impressive in the Quang Ngai and Quang Tri areas. The beaches are remarkable linear and have rivers and inlets paralleling the coastlines. Movement along the coastline is difficult. The area known as the Street Without Joy is a classic example of the compartmented topography in this region. During the first phase of the northeast monsoon, this northeastern region becomes inundated by torrential rains, and trafficability and cross-country movement of tracked vehicles is impeded. During the second phase of this monsoonal period, and for the remainder of the year, most of the region is suitable for light-armored operations.

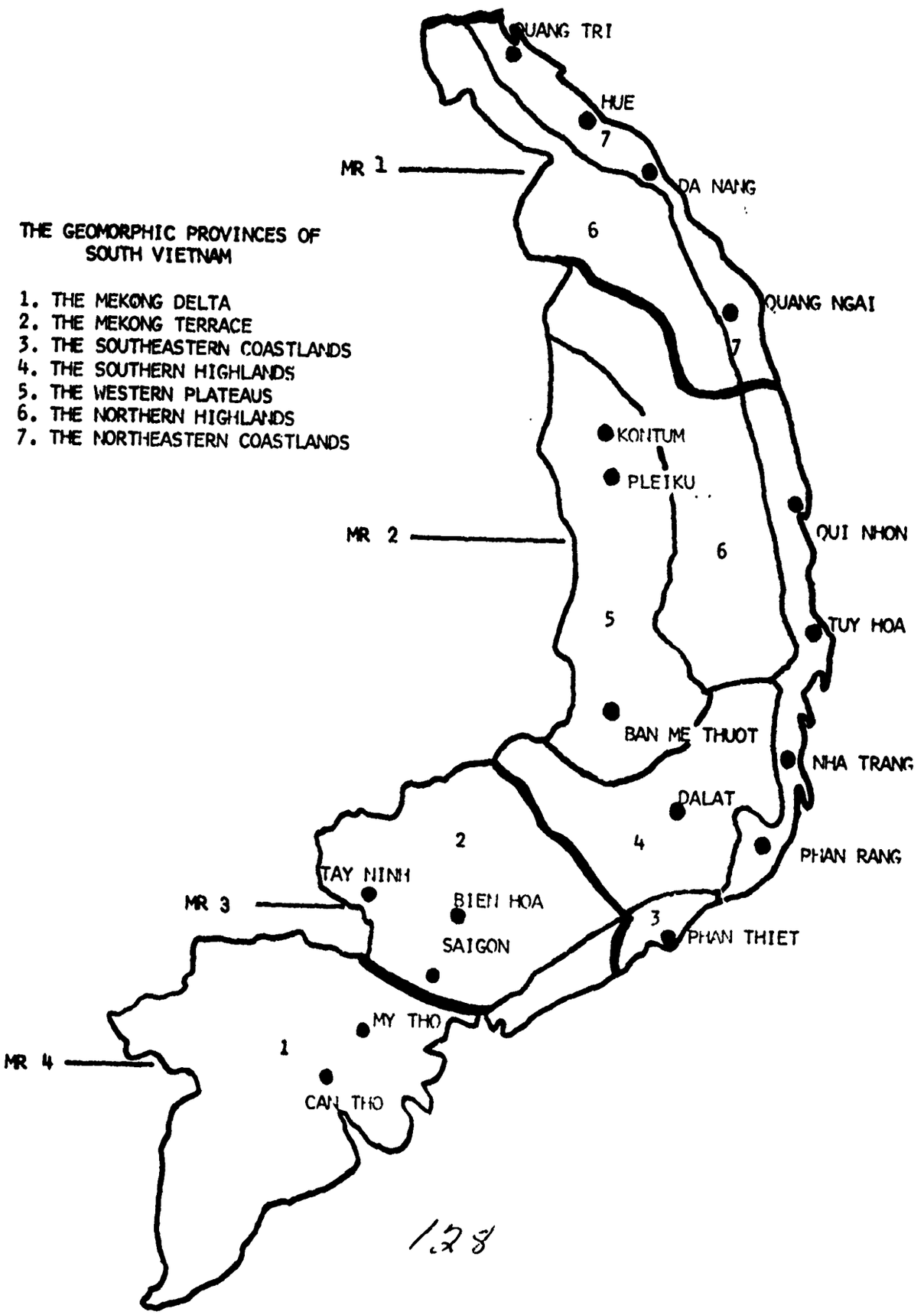

Figure J-1 Geomorphic Provinces